Essays on the cause and consequences of market distortions

By
OBERT PIMHIDZAI

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Supervisor: Professor Martin Wittenberg

Abstract

In contrast to past literature on competitive bribery, the thesis demonstrates that competitive bribery for rents generated from market distortions is inefficient. However, self enriching policy makers have incentives for implementing these distortions in order to maximize the appropriation of rents. Their success in raising distortions is higher when the electoral process is easily manipulated. Thus distortions are higher and last longer in the absence of electoral accountability. Such distortions worsen the deprivation of human capabilities and functionings, as evidenced by worsening health outcomes among children in Zimbabwe after the policy changes since 2000.

Market distortions are sub-optimal and attract bribery. Given arguments in the literature that competitive bribery is efficient, this thesis investigates whether this "efficiency outcome" extends to bribery for rents generated from distortions. This analysis questions the generalization of the "efficiency outcome" from models of competitive bribery. The thesis applies auction theory to demonstrate that a symmetric model of competitive bribery can produce an inefficient outcome. In particular, it shows that efficiency in competitive bribery models is sensitive to the source of rents. If the valuation of rents is misaligned to society's preferences, then competitive bribery produces an inefficient outcome. The generalization that competitive bribery is efficient is therefore misleading. This is illustrated using rents generated from market distortions hence the outcome confirms the inefficiency of bribery for rents generated from market distortions.

Bribes for rents generated by market distortions accrue to office bearers. Therefore, self enriching policy makers find rent generating distortions attractive despite their negative impact on efficiency and social outcomes. These policy makers seek to extract maximum rents from distortions subject to constraints imposed by considerations for political survival. The political considerations are determined by the quality of electoral institutions. When electoral institutions are weak, incumbents can use electoral fraud to circumvent political pressure generated by the negative effects of high distortions. They maximize on financial rents by raising the level of distortions even when large welfare losses arise. Un-

democratic regimes will therefore choose higher levels of distortions. They are less likely to adjust high distortions too. The thesis demonstrates this argument using a model of electoral accountability to compare distortions chosen by an incumbent with and without the possibility of electoral manipulation. The model shows that an incumbent chooses higher distortions when electoral manipulation is feasible.

This theory is confirmed on exchange rate distortions in Sub-Saharan Africa. Dictatorships overvalue by between 22.4 and 26.6 percentage points more than complete democracies. These estimates are obtained from dynamic panel GMM estimation using data for non CFA Sub-Saharan countries. The quality of democracy is measured by the polity 2 score from the Polity IV data and exchange rate overvaluation by the black market to official exchange rate ratio. Further confirmation of the hypothesis comes from conditional logit estimation results. They show that undemocratic regimes are more likely to excessively overvalue the exchange rate than democratic regimes. This explains the persistence of excessive distortions in countries with weak institutions. Such distortions can not be wholly attributed to lobbying by special interest groups or to the political use of economic inefficiency as generally argued in the literature.

Zimbabwe offers a practical example of distortions which are implemented or sustained for maximizing the appropriation of rents by the incumbent. The government stepped up its intervention in markets since 2000. The resulting distortions shifted command over resources and placed them in the hands of the elite while their intensity and persistence had devastating effects on the economy. Elections over this period have been accompanied by electoral intimidation and manipulation. Thus the incumbent government relied on electoral manipulation to continue the appropriation of rents from market distortions. Zimbabwe provides a good case study of the consequences of market distortions that are sustained to benefit the incumbent in the presence of weak democratic institutions.

The thesis uses the 1999 and 2005/06 DHS data to make a comparative analysis of changes in social outcomes after the policy shift in Zimbabwe. This analysis sheds light on the social costs of market distortions that are sustained to benefit the incumbent. The average number of items consumed by under 5 year old children declined by 34%, mean height for age by 19% and mean weight for age by 16%. The biggest declines were on outcomes for children living in poor and middle class households. Children in richer households were the least affected. The significant negative coefficient of food consumption in the height and weight for age regressions show that food consumptions worsened child health outcomes. The decline in food consumption contributed to 37% and 57% decline in means of height and weight for age respectively.

Wealth inequality in 2005/06 was 16% relatively higher than inequality in 1999. Wealth is measured by an asset index derived from principle component analysis and its inequality by the McKenzie 2005 index. Inequality in food consumption increased as evidenced by a change in the Kakwani concentration index for food consumption by 48% of the 1999 value. A decomposition of changes in health inequality shows that increased inequality in food consumption contributed to increased nutrition inequality by a magnitude of 11% and 6% of stunting and underweight concentration indices in 1999.

These results indicate that market distortions worsened social outcomes in Zimbabwe. Yet the distortions persisted for almost a decade due to weak electoral accountability in that period. This shows that a weak intuitional environment which erodes electoral accountability promotes policies that are costly to society. Distortions that arise from such policies have an impact that extends beyond efficiency in allocation. They affect outcomes which are intrinsically important aspects of well-being.

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Dedication

To my mother Angeline Chikamhi and my daughter Anesu.

Acronyms and abbreviations

AERC	African Economic Research Consortium
AIDS	Acquired Immuno Deficiency Syndrome
CZI	Confederation of Industries Zimbabwe
CFA	Common Franc Zone
CSO	Central Statistics Office of Zimbabwe
DHS	Demographic and Health Survey
ESAP	Economic Structural Adjustment Programme
EPP	Estimation and Projections Package
FAO	Food and Agriculture Organization
HIV	Human Immuno-Deficiency Virus
IMF	International Monetary Fund
MP	Member of Parliament
MOHCW	Ministry of Health and Child Welfare
NGO	Non Governmental Organization
NOCZIM	National Oil Company of Zimbabwe
PPP	Purchasing Power Parity
ODA	Overseas Development Assistance
OECD	Organization of Economic Co-operation and Development
RBZ	Reserve Bank of Zimbabwe
UNGASS	United Nations General Assembly Special Session on AIDS
WBES	World Business Environment Survey
WFP	World Food Programme
ZANU PF	Zimbabwe African National Unit Patriotic Front
ZIMPREST	Zimbabwe Programme for Economic and Social Transformation
ZEPARU	Zimbabwe Economic Policy Research Unit
ZSE	Zimbabwe Stock Exchange

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Chapter 1

Introduction

1.1 Overview of the thesis

Despite continued calls for reform, market distortions remain widespread across the world. For example, only 39.4% of firms in the World Business Environment Survey for 2000 (WBES 2000) reported absolute non interference by government in their pricing decisions. In the agriculture sector, significant distortions in the form of tariffs, subsidies, commodity taxes and price controls remain in place. Indeed, the Welfare Reduction Index (WRI) of market distortions in tradable agricultural commodities in African countries averaged 30% in the 2000 - 2004 period and remained above 25% in 2007 (Anderson & Croser 2009)[1]. Further evidence of government interventions in pricing across the world comes from controls on the price of tortillas in Mexico in 2008 and the reverting to blanket price controls by the Zimbabwean government in 2007. Thus reliance on market distortions as a policy tool remains high.

Due to this prominence in economic policy, market distortions still warrant attention in both academic and policy discourse. As part of the discourse, this thesis focuses on three distinct issues related to both the political economy and economic consequences of market distortions. The thesis places great emphasis on the rent generating effects of market distortions, particularly how rents influence the level of distortions chosen in a particular

[1]The WRI measures the effects of distortions on a country's welfare. The index is calculated as a uniform tariff that results in an aggregate loss in welfare equivalent to that caused by the actual distortions. The reported WRI for agriculture is based on a sample of 75 countries accounting for 92% of the world's agriculture (see Lloyd, Croser & Anderson 2009)

economy and their implications for efficiency and the distribution of social outcomes.

The specific emphasis on market distortions' rent generating effects emanates from the recognition that market distortions cause corruption (Bardhan 2006, Aidt 2003, Rose-Ackerman 1999). This ushers us into the "grease vs sand" controversy in the literature on corruption. On one hand, is the argument that corruption is "sand" which reduces growth, investment and productivity and increases costs (Mauro 1995, Wei 2000). On the other hand, it is argued that corruption is "grease" which facilitates trade, promotes allocative efficiency, lowers costs and clears the market (Leff 1964, Beck & Maher 1986, Egger & Winner 2005). This debate continues to attract attention in the literature (see Aidt 2009, Aidt & Dutta 2008).

The "greasers" argue that bribery enhances efficiency when regulation is bad (pioneered by Leff 1964) and that when bribery is competitive, efficiency in allocation is maintained. The first argument has already been countered by Kaufmann & Wei (1999) but the second argument is largely unchallenged. Indeed some proponents of the "corruption as sand" hypothesis concede that competitive bribery is efficient (Rose-Ackerman 2002). In this argument, auction theory is applied to models of competitive bribery focusing on symmetric equilibria, to demonstrate that bribery is efficient– even under incomplete information. This prompts the following question: Does this "efficiency outcome" hold for competitive bribery for rents generated from market distortions? This brings to question the generalization of the efficiency outcome in competitive bribery models.

This question is motivated from observing that market distortions are suboptimal (from the first welfare theorem). It is natural to question whether bribery for rents generated by a suboptimal policy lead to an efficient outcome. Previous models of competitive bribery are based on bribery for fixed price contracts. The rents from this contract are higher for the least cost firm. It pays the highest bribe and gets the contract hence efficiency is maintained. Is this efficient outcome not simply generated from a coincidence/alignment of the source of rents to society's preferences as determined by the model specification? What happens when an inefficient producer values the rents more than an efficient producer? These questions form the thesis' first research issue which shall be addressed in chapter 2. The chapter uses a model in which firms bribe competitively to capture rents from input subsidies. High cost firms obtain higher rents from this input subsidy. They bribe more and get the input subsidies ahead of lower cost firms. Competitive bribery promotes inefficiency in this case. This is in contrast to outcomes that have been generated in other competitive bribery models (see Lien 1986, Kim 2000).

The contrast emanates from a misalignment between the valuation of rents and society's

preferences. Societies prefer not to subsidize inefficient producers. However the subsidy benefits inefficient producers more than it benefits efficient producers. Incentives for bribery are therefore higher for inefficient producers who then pay higher bribes, hence the contrast. Indeed, the valuation of rents generated from market distortions is generally mismatched with preferred outcomes in society. The rents increase corruption too. Nevertheless, distortive policies continue to be implemented despite the existence of alternative instruments that are more efficient and produce better outcomes. Distortions seem to be preferred (Bates 1987) despite increasing inefficiency, bribery and the possibility of a regressive benefit incidence due to their rent generating effects. Why is that so?

To address this question, the thesis revisits the discussion on why market distortions are a preferred policy instrument and why they persist. It argues that the same ills of market distortions, i.e. bribery and regressive benefit incidence, makes them very attractive for implementation by self enriching policy makers. Literature on the political economy of market distortions generally argues that political considerations play a critical role in determining market distortions. Either distortions are set in response to lobbying by special interest groups (Bates 1987, Grossman & Helpman 1994), or they represent a tactical redistribution of excludable benefits to key constituencies by politicians seeking to secure political power (Cox & McCubbins 1986, Dixit & Londregan 1996). These theories assume a complete democracy and their emphasis on the objective of securing political power lead to predictions that are inconsistent with any distortions that make a majority of voters worse off. Yet such distortions are observed in practice. The thesis departs from the assumption of complete democracy to explain the existence of excessive distortions.

The thesis argues that private financial motives play a more dominant role in weak democracies where policy makers seek to maximize the appropriation of rents generated from market distortions. Political considerations are important only for defining the constraints to the appropriation of these rents. When electoral institutions are weak, incumbents use electoral fraud to circumvent political pressure generated by negative effects of high distortions. They maximize on financial rents by raising the levels of distortions. Thus more democratic societies will have lower distortions than autocratic societies similar in characteristics other than the political regime. This argument is presented in chapter 3.

The argument is illustrated using a model of electoral accountability to compare distortions chosen by an incumbent with and without the possibility of electoral manipulation. The outcome of the model indicates higher distortions in the former. Empirical support of this result is then presented for the case of exchange rate over-valuation in Sub Saharan Africa. Results from a dynamic panel estimation show that totally autocratic

regimes over-value the exchange rate by a higher magnitude than fully democratic ones. In addition, conditional logit estimation results show that totally autocratic regimes are more likely to have excessive exchange rate over-valuation than democratic regimes. With undemocratic tools to subvert political pressure, they can continue to appropriate rents from an overvalued exchange rate for a relatively longer period. This was the case with distortions in Zimbabwe since 2000.

Since 2000, the Zimbabwe government made major policy changes towards greater government intervention in markets. Subsequent polices introduced economy wide distortions like exchange overvaluation, price controls, dual pricing and selective subsidies. These generated high rents. There is anecdotal evidence that only a privileged few (mainly those in positions of influence), benefited from these distortions (Reserve Bank of Zimbabwe 2006, ANDNetwork Journalist 2006). The continued existence of these distortions has been attributed to the benefits they brought to the elite (Chikukwa 2004).

Distortions in Zimbabwe persisted despite their apparent negative impact on the majority of citizens and their perverse effects on the economy as a whole. The weakness of democratic institutions and perceived manipulation of elections in Zimbabwe since 2000 are evident. The incumbent government continued to extract high rents because it used electoral manipulation to mitigate political pressure caused by welfare losses from market distortions. Thus distortions in Zimbabwe are a good example of distortions sustained to financially benefit the incumbent in a weak institutional environment. This makes Zimbabwe a good case study for analyzing the welfare impact of rent generating distortions sustained to benefit the incumbent in the absence of electoral accountability. This case study is done in chapter 4.

Chapter 4 shall investigate the impact of market distortions on health outcomes among children in Zimbabwe. Focusing on this social outcome departs from the predominant focus on the macro effects of market distortions. The particular focus on health outcomes is motivated by a number of reasons. First, health is a direct measure of well-being (Sahn & Younger 2005, Sahn & Stifel 2003). Secondly, health has wide reach and relevance such that Sen (2004)[pp78] noted "the freedom to be well nourished and live disease free lives" among capabilities any theory of justice or social assessment cannot overlook. Thirdly, health achievements largely influence people's ability to exercise most other freedoms and capabilities. Last but not least, health inequality is materially relevant if the source is poor economic policy (Sen 2002), as with the case of market distortions which are the focus of analysis in this thesis.

In chapter 4 the thesis specifically answers the question: "What are the effects of market

distortions on health outcomes in Zimbabwe?" The thesis hypothesizes that policy changes generated rents that benefited only a few by design. This shifted command over resources and placed them in the hands of a few people in positions of influence. The majority were left with minimal resources. This reduced access to food and worsened health outcomes on average. The poorest were the most affected since a majority of beneficiaries from rents are the elite. Thus policy changes increased wealth and consumption inequality. This ultimately increased health inequality.

The chapter presents empirical evidence from a comparative study using the 1999 and 2005/06 DHS data for Zimbabwe to support the above hypothesis. The study finds that on average, food consumption declined across all wealth quartiles. However, the decline was greater for children living in households in the poorest and middle wealth quartiles. It was lowest for children in the richest quartile. Both the mean of height for age and mean of weight for age declined significantly. Regression results highlight a significant contribution of the decline in food consumption to the decline in both height and weight for age.

Estimates of the McKenzie's (2005) index of wealth inequality shows that wealth inequality was relatively higher 5 years after the policy changes. Based on the Kakwani concentration index, inequality in food consumption increased too. A decomposition of changes in health inequality reveals a substantial contribution of the increase in food consumption inequality on increases in health inequalities. These findings indicate that increased market distortions in Zimbabwe since 2000 have far reaching adverse effects on intrinsically important aspects of human well-being. These findings highlight the negative effects of high market distortions designed to maximize the extraction of rents in a weak institutional environment.

1.2 Objectives of the thesis

In pursuit of the research issues highlighted above, the thesis aims to achieve the following objectives

1. Construct a counter-example to show that competitive bribery is not generally efficient but depends on the source of rents
2. Provide an alternative theory on incentives for market distortions that highlights the influence of quality of electoral institutions and is consistent with the existence of high market distortions that are observed in some developing countries.

3. Empirically analyze the social impact of market distortions with specific reference to their impact on health outcomes

1.3 Organization of the thesis

This chapter has established the area of focus, introduced the research issues and outlined the objectives of the thesis. The research issues shall be dealt with in three essays each constituting a chapter. The first essay is presented in chapter 2. It develops a theoretical model to demonstrate that the "efficiency outcome" of competitive bribery is sensitive to the source of rents. Specifically, it shows that "efficiency" emanates from the coincidence of society's preferences and firm's valuation of rents which is not the case with most distortions.

Chapter 3 argues that distortions are sometimes implemented to maximize benefits from bribes and other forms of rent appropriation subject to institutional constraints. This argument presents an alternative theory for explaining the existence of excessive distortions that cannot be adequately explained by existing theories. The theory is tested on exchange rate overvaluation in non-CFA Sub-Saharan countries.

Chapter 4 explores the effects of market distortions on social outcomes. This is done through an empirical examination of the impact of market distortions on health outcomes in Zimbabwe. Lastly, chapter 5 draws conclusions from the outcomes and findings from the three analytical essays and discuss their implications. It also highlights future areas of research arising from the findings of the thesis.

Chapter 2

Bribery and efficiency: A counter-example from rents generated by market distortions

2.1 Introduction

Although the adverse effects of corruption seem apparent, there has been debate on the economic effects of corruption. On one hand, some argue that corruption is "grease" which facilitates trade, promotes allocative efficiency, lowers costs and clears the market. On the other hand, others argue that corruption is "sand" which increases costs and reduces growth, investment and productivity (Aidt 2009). Models of competitive bribery with a focus on symmetric equilibria, have been used to demonstrate that bribery is efficient (Lien 1986). This has been supported by similar conclusions from competitive bribery in procurement. Indeed, some proponents of the "corruption as sand" hypothesis concede that competitive bribery is efficient (Rose-Ackerman 2002).

This chapter questions the generalization of this result. It specifically questions whether the "efficiency outcome" holds for competitive bribery for rents generated from market distortions. The chapter appeals to auction theory to illustrate its argument. In a symmetric equilibrium, a bidder with the highest valuation of the auctioned item makes the highest bid and wins the item. Thus, whenever there is coincidence between bribers' valuation of rents and society's preferences, an efficient outcome ensues. Bidding for fixed price

contracts and procurement contracts are such examples. In these cases, low cost firms obtain higher rents from the contract than high cost firms. They offer higher bribes and win the contracts. This allocation is efficient because society is better off when the least cost firm wins the contracts. Can this outcome be generalized?

The chapter argues that this "efficiency outcome" can not be generalized. Competitive bribery is inefficient whenever the valuation of rents is misaligned to society's preferences, even if we restrict ourselves to symmetric equilibria. Input subsidies are a good example. An inefficient producer gets higher rents from an input subsidy than an efficient producer. The inefficient firm will pay a higher bribe and get the subsidy ahead of the efficient producer in the absence of liquidity constraints. However, society does not prefer to subsidize an inefficient producer. The bribery outcome is not efficient. This contradicts the general conclusions from competitive bribery models and proves that the "efficiency outcome" from these models is sensitive to the source of rents. The "efficiency outcome" is a particular rather than a general case. This explains the weak empirical evidence in support of the "grease" hypothesis despite numerous theories advanced in its favor (see Aidt 2009).

The valuation of rents from the input subsidy is misaligned to society's preferences in this example. This is the source of inefficiency in the outcome. Rents generated from market distortions are misaligned to society's preferences in general. For example, less competitive firms bribe politicians to obtain legislation that guarantees monopoly rents, higher tariffs in their sectors while advocating for price ceilings in others. Rents in these cases are more valuable for less competitive producers and reduce the welfare of society. Thus competitive bribery for rents generated from market distortions is generally inefficient.

The chapter is organized as follows: Section 2.2 provides an overview of the debate on economic consequences of corruption and looks at efficiency in competitive bribery models in the literature. Section 2.3 builds the model of competitive bribery based on rents from an input subsidy and presents its solution. Section 2.4 discusses the general implications of results and section 2.5 concludes the chapter.

2.2 Economic consequences of corruption: A review

The debate on the economic consequences of corruption has been termed the "grease or oil vs sand" controversy. This debate is on going (Aidt 2009, Aidt & Dutta 2008). The "sanders" (i.e. those who say corruption is sand), argue that corruption has negative

effects. They argue that corruption reduces investment, diverts government expenditure from productive spending, increases transaction costs, distorts allocation of talent and increases inequality. Through these effects, corruption reduces economic development (Rose-Ackerman 1999).

The negative impact of corruption on growth was highlighted by Mauro (1995). Mauro argued that corruption reduces investment and hence economic growth. He estimates cross country growth regressions to provide empirical support for the argument. The estimates show that an improvement in the corruption index by one standard deviation increases investment by 2.9% of GDP and improves annual growth rate of GDP by 0.8 percentage points. This finding is reinforced by evidence that corruption reduces the quality of public sector investment (Mauro 1998, Tanzi & Davoodi 1997) and shifts government expenditure away from productive components to those where bribes can be easily generated (Wei 2000). "White elephant" projects in most African countries are a case in point.

Corruption also affects economic development by reducing productivity in the private sector. This is illustrated by Blackburn, Bose & Haque (2006). Bureaucratic corruption reduces revenue that accumulates to the government. This inhibits public sector investments. Private sector productivity which depends on public infrastructure is consequently reduced. The quality of private investment is negatively affected by corruption too. Entrepreneurs are discouraged from adopting irreversible but more productive technologies if such technologies attract higher bribe payments. Instead, they opt for the informal sector or inefficient "fly-by-night" technologies which reduce costs of adjustment to future bribe demands by corrupt officials (Svensson 2005). Others (Rose-Ackerman 1999, Rose-Ackerman 2002) highlighted that bureaucratic corruption increases transaction costs through bribe payments and the opportunity cost of otherwise productive time managers spend with bureaucrats. The consequence is a slowdown in economic activity and a rise in unemployment.

Bribery and rent seeking stifle entrepreneurship and distort incentives. This alters the allocation of talent (Murphy, Shleifer & Vishny 1991, Murphy, Shleifer & Vishny 1993, Acemoglu 1995). Income earned from bribery may be higher than income earned through honest and productive entrepreneurship activities. Therefore, rent seeking activities attract talent away from productive activities. This consequently stifles growth. Acemoglu & Verdier (1998) in particular, use an example in which the best talent abandons entrepreneurship and compete to be bureaucrats in order to capture rents from bribery. This reduces innovation, productivity and prospects of economic opulence.

Inequality could also increase as a result of corruption. Blackburn & Forgues-Puccio (2007)

argue that bribery of tax collectors by the rich compromises the ability of governments to generate resources for transfers to disadvantaged groups of the society. Therefore, the gap between the rich and poor widens. Foellmi & Oechslin (2007) show that under credit rationing, bribery in the banking sector prevents poor but innovative individuals from engaging in entrepreneurship. This restriction to entry generates monopoly rents for the existing (already rich) entrepreneurs. The poor are condemned to become low wage laborers while existing entrepreneurs enjoy monopoly rents. A similar argument is applied to licensing and business registration. Talented individuals who cannot afford to pay large bribes are restricted from entry into entrepreneurship (Ahlin 2001). This increases inequalities in an economy hence corruption is bad.

However, some dissenting voices argue that corruption is good. There are two lines of argument that are offered. The first, due to Leff (1964), is that corruption is grease which oils the wheels of commerce. The second, due to Lui (1985) and Beck & Maher (1986), is that bribery generates an efficient outcome whenever it is competitive. Arguments in support of corruption as grease are centered around these two ideas.

Leff (1964) argued that bribery allows greater participation by entrepreneurs and provides a way around red-tape. This way, corruption actually improves efficiency and serves as an insurance against bad policies. Egger & Winner (2005) concurs and provides empirical support of this view. Contrary to many other studies (e.g. Wei 2000, Cuervo-Cazurra 2006), Egger & Winner finds that FDI increases with corruption. Additional theoretical arguments in favor of the hypothesis came from Huntington (1968). He argued that bribery enhances participation of marginalized communities otherwise excluded by the existing rules. Hence corruption is good. Aidt (2003) also alludes to the argument that corruption is good because it increases allocative efficiency.

Braguinsky's (1996) paper offers a more sophisticated argument. The paper attempts to demonstrate that corruption may actually increase adoption of new technology thus increasing economic growth. This argument runs as follows. The desire to capture monopoly rents encourages innovation. Although innovation increases growth when it is adopted quickly, it is beneficial to an entrepreneur only if others adopt it with a delay. Bribery of researchers, which happens with a lag, quickens the adoption of new technology while providing the innovator a small window period to profit from the innovation. Such bribery is therefore good for the economy. This reasoning implicitly assumes that corruption only takes place after observing the benefits of the innovation. This rules out forward looking corruption behavior hence the argument is questionable. In any case, why rely on corruption instead of patents?

The bottom line in the "corruption is grease" argument is that bribery is good whenever regulation is bad because bribery is a way around the bad rules. This argument has been countered by Kaufmann & Wei (1999) using a sequential game in which the level of red tape is endogenous. The first mover is the bureaucrat, who chooses the level of red tape that maximizes revenue from bribery. The firm is the second mover, which after observing the red tape, offers a bribe to maximize its profits. The optimal strategy for the bureaucrat is to set red tape at a level that induces a firm to pay the maximum bribe it can afford. Consequently, firms that can pay more face greater obstacles and any benefits from "cutting corners" are lost.

Based on data from three worldwide surveys, Kaufmann & Wei provide empirical support for their argument. They find a positive correlation between the amount of bribes and time spend negotiating rules with bureaucrats. More evidence has been found from firm level data. In particular, Svensson (2003) find that bureaucrats demand higher bribes from more profitable firms in Uganda. Using the WBES (2000) data, Clarke & Xu (2004) found evidence that more profitable firms pay higher bribes to parastatals. Both papers argue that extortions are higher for more profitable firms instead of the postulated argument that more profitable firms are willing to pay more. Taking this into consideration, along with weak evidence in support of the "greasers", there is little merit in the "grease" hypothesis (Aidt 2009). This leaves the second argument which I now turn to.

The second argument is that when bribery is competitive, it generates an efficient outcome and serves to clear the market (Lui 1985, Beck & Maher 1986, Lien 1986). This led to the generalization that competitive bribery is efficient (see Rose-Ackerman 2002). This chapter disputes this generalization and hopes to contribute towards settling the debate. In so doing, the chapter highlights the inefficiency of market distortions. However before considering the argument against this generalization a brief review of the "competitive bribery is efficient" hypothesis is provided below.

2.2.1 Competitive bribery and efficiency

The notion of an efficient outcome from competitive bribery was popularized by the work of Beck & Maher (1986) and Lien (1986). The later, (Lien 1986) uses the former's result showing isomorphism between competitive bidding and bribery to show that competitive bribery is efficient under incomplete information. Lien proves the existence of a unique symmetric Nash equilibrium in which bribery does not result in efficiency losses.

Lien uses a model in which n firms, each knowing only its production cost c_i, compete for a government contract with a predetermined price P. The n firms privately negotiate with a government official for this contract. They fully know that a firm offering the highest bribe is awarded the contract. Each firm has incomplete information on rivals' costs. It assumes that each rivals' costs is drawn independently from a common distribution $F(z)$, generating a common distribution of gross profit $z = P - c$ with support $[\underline{z}, \overline{z}]$. A firm has a bribe function $B_i(z)$ which is assumed to be a strictly monotonically increasing function of its gross profits. Each firm seeks to maximize its expected profits given by (2.1)

$$E[\pi(B_i)] = (z_i - B_i) * \Pr(B_j \leq B_i, \forall j = 1, ..., n) \tag{2.1}$$

Assuming that bribes are reimbursed, the expected profits are given by the gross profit net the bribe paid, multiplied by the probability of getting the contract. This probability is simply the joint probability that all the other $n - 1$ firms pay a lower bribe. Thus the firm maximizes (2.2)

$$E[\pi(B_i)] = (z_i - B_i)\prod_{j \neq i}^{n} F[B_j^{-1}(B_i)] \tag{2.2}$$

Solving for the bribe functions for each firm from the first order condition of (2.2) gives a Nash equilibrium which is unique if firms adopt the same distribution function $F(z)$. If all firms have common beliefs about the cumulative density function over possible gross profits, this equilibrium is symmetric. The optimal bribe function in this equilibrium is given by (2.3)

$$B_i(z) = z_i - \frac{\int_{\underline{z}}^{z} F^{n-1}(t)dt}{F^{n-1}(z)} \tag{2.3}$$

In this equilibrium, the most profitable firm offers the highest bribe[1] and is awarded the contract. Thus bribery is efficient. This outcome is a common result in auction theory. In symmetric equilibria, a bidder who places the highest value on the auctioned item always wins. The efficiency result holds in Lien's (1986) model because the source of rents is a fixed price contract and differences in rents (valuation) emanate from differences in costs.

[1]Note that from integration by parts, (2.3) is a solution to $[\int_{\underline{z}}^{z} t_i(n-1)f(t)F^{n-2}(t)dt]/[\int_{\underline{z}}^{z}(n-1)f(t)F^{n-2}(t)dt] = E[Y_2|Y_2 < z_i]$ where Y_2 is the second order statistic. It thus follows that $B_i(z)$ is increasing in z hence the conclusion that the least cost firm (i.e. firm with highest z_i) wins.

Lower cost firms have higher rents. Therefore, the least cost firm pays the highest bribe and gets the contract. The outcome is thus efficient since optimal allocation entails the least cost firm getting the contract.

This result has been upheld in procurement models where firms compete in two dimensions, the bid price (sometimes price and quality combination) and the bribe offer. One example is the result from Kim's (2000) paper on competitive bribery in procurement. The paper models the behavior of firms competing for a contract to be awarded by a corrupt bureaucrat. The bureaucrat has some discretion to manipulate bids in favor of the highest briber. However, his ability to manipulate bid prices is limited by an exogenous probability of detection. This probability is increasing in the price he sets. Each firms knows only its own cost and competes on the bid price and side payments. A firm offering a bid price -bribe combination generating the highest utility to the bureaucrat gets the contract. It is shown that the least cost firm wins the contract in both the case of kickbacks (bribes are reimbursed to losers) and that of entry costs (no bribe reimbursement). Therefore, the allocation outcome under competitive bribery is similar to that of competitive bidding in the absence of corruption. Thus competitive bribery is efficient (also see B*ü*chner et al. 2006).

Burget & Che (2004) offer a qualified conclusion. They show that competitive bribery in procurement is efficient only when the agent doesn't have substantial power to manipulate bids. Otherwise, there exists multiple equilibria in which the inefficient firm wins with a positive probability. Nevertheless when the procurement agent is corrupt, the buyer designs a scoring mechanism which ensures the more efficient firm wins the contract under competitive bribery. In the final analysis, an efficient allocation ensues.

The efficiency outcome in the above models should not be generalized because they are limited only to symmetric equilibria. Auction theory predicts that the efficiency outcome does not hold in asymmetric equilibria and multi-object auctions with multi-unit demands (Klemperer 2000, Krishna 2002). The first is analogous to bribe discrimination in a bidding process in which a bureaucrat or buyer has a soft spot for particular firms. The second relates to multiple tenders administered by the same bureaucrat/procurement officer. Both cases are widespread in reality. Lien (1987) and Lien (1990) respectively show that when firms have asymmetric information and when the bureaucrat discriminates among firms, an efficient allocation is elusive.

This chapter offers another critique by showing that even in the realm of symmetric competitive bribery, inefficient outcomes are possible and perhaps more prevalent. I argue that the allocation outcome in contracting models is efficient because differences in values

of rents across firms coincide with society/buyer's interests. However, subsidies on inputs pose a different problem. With input subsidies, differences in valuation are misaligned with society's preferences. Inefficient firms value the rents more than efficient firms but society prefers the efficient firm to get the subsidy. We should expect an inefficient outcome if auction theory is similarly applied. Consequently, the "efficiency outcome" is sensitive to the model set-up, particularly the source of rents vis-à-vis society's preferences. The model considered below seeks to demonstrate this point.

2.3 The model

Consider the following environment with n risk neutral firms facing different costs of operation[2] $c_i = \alpha_i x$, where c_i denotes costs for firm i of cost type α_i. The cost type is randomly distributed over support $[\underline{\alpha}, \overline{\alpha}]$. All firms' cost types are independently drawn from an identical distribution with probability distribution $F(\alpha)$ and density $f(\alpha)$. Firms have a unit demand of an input X with a market price x^m, but the government has decided to supply it at a subsidized price $x^s < x^m$. The government has insufficient resources to give the subsidy to all firms, therefore, the subsidized input is rationed. It can only be given to $k < n$ firms[3]. Thus a firm's profit function is $\Pi_i = R - \alpha_i x$, where $x \in \{x^s, x^m\}$ and R is revenue[4].

Firms apply and get assessed by a bureaucrat to get this input. Under fair allocation, a firm has probability k/n of getting this input. Giving a bribe increases the likelihood for getting the subsidized input if the bribe is accepted. The bureaucrat faces a cost of accepting a bribe ς reflecting the degree of honesty (or incentives he faces). He accepts a bribe whenever it exceeds this cost and rejects it when the bribe offered is below the cost. For simplicity, assume that $\varsigma = 0$ [5]. Firms are then ranked by the size of their bribes with the k-highest bribers getting the input. Thus bribery is competitive. Firms compete for

[2] A more general cost function is described in appendix 2.A

[3] the reader is referred to chapter 3 for the incentives and political economy of such a subsidy

[4] An alternative model yielding the same result is one in which government compensates or subsidies a proportion θ of eligible firms' particular cost component or is considering such legislation for certain sectors yet to be identified. Define costs c_i, the subsidy to firm/sector i is $s_i = \theta c_i$. Clearly then, high cost firms/sectors will gain more from the compensation/ subsidy than low cost firms/sectors. Therefore, the result of our analysis applies to such a framework. However, this particular form is preferable because it exhibits a clear and simple demonstration of how merely changing the profit function (hence rents) specification changes the outcome.

[5] The assumption of zero costs is made for simplicity. Relaxing this assumption changes the game into a discriminatory auction with a reserve price instead of a discriminatory auction without a reserve price. In both auctions, firms with the highest rents value win, hence the general result of the model holds.

the input only. Except for bribes, the bureaucrat has no strategic interests in any of the firms.

The sequence of events is as follows

1. Nature determines the cost type (α_i) of the firm.
2. Each firm observes only its cost type. It applies for the subsidized input with a bribe offer $b_i \geq 0$ assuming that other firms are independently drawn from a common, continuously differentiable distribution $F(\alpha)$.
3. The bureaucrat receives firm i's application and decides whether to accept or reject the bribe. The bureaucrat ranks firms according to the size of their bribes and the top k ranked firms get the subsidized input. In the event of a tie on the kth highest bribe, the input is allocated using a lottery.
4. If granted, firm i pays the subsidized price otherwise it pays the market price

Except for the source of rents, this model adopts all assumptions by Lien (1986). Following the result in Lien, a common cumulative distribution is assumed to guarantee a symmetric equilibrium. A multiple unit case is considered here since subsidies generally benefit more than one firm. From auction theory, multiple unit auctions result in inefficient allocations when bidders have multi-unit demand. Therefore, single-unit demand is assumed because it generates a solution similar in outcome, to that of the single unit case (Krishna 2002).

The source of rents is the defining difference between this model and Lien's (1986) model. Consequently, differences in efficiency outcomes are attributable to the misalignment between society's preferences and rent seekers' due to subsidies, in contrast to the alignment observed in models of procurement or contract awarding. Note that rents stem from rationing of the subsidy in this model. This matches stylized facts about developing countries– they subsidize but they rarely command enough resources to provide for everyone.

2.3.1 Solving the model

Given the profit function $\Pi_i = p - \alpha_i x$, firm i's profits are $\Pi_i^s = p - \alpha_i x^s$ if it gets a subsidized input and $\Pi_i^m = p - \alpha_i x^m$ if it fails to get the subsidized input. Without corruption, the subsidy is allocated using a lottery hence the probability of a firm getting the input is exogenous. Thus firm i's expected profits in the absence of corruption are given by (2.4) below.

$$E[\Pi_i^{nc}] = \Pi_i^m + \frac{k}{n}\alpha_i(x^m - x^s) \tag{2.4}$$

From this expression, a firm's expected profits equals its profits when it pays the market price (Π_i^m) plus the expected benefit (rents) from getting the subsidized input ($\frac{k}{n}\alpha_i(x^m - x^s)$). High cost types obtain higher rents for any given probability of winning the subsidy (i.e. $\alpha_2(x^m - x^s) > \alpha_1(x^m - x^s)$ whenever $\alpha_2 > \alpha_1$). Expected rents are increasing in both the probability of getting the subsidized input and the size of the subsidy. Consequently, firms have an incentive to offer bribes to increase the probability of getting these rents.

Introducing bribery

Now assume that firms can offer bribes according to some bribe function $\beta_i(\alpha)$ to increase the probability of getting the subsidized input. The bribe function is assumed to be a strictly monotonically increasing function of the cost type since rents are increasing in the cost type. In essence, this restricts the type of equilibrium solution to symmetric equilibria only. A profit maximizing firm's problem is to offer a bribe (b) that maximizes its expected profits. At this point, I make use of Beck & Maher's (1986) result showing isomorphism between competitive bidding and competitive bribery. The same agent who wins under competitive bidding wins under competitive bribery.

Accordingly, the above game is set as a multi-unit auction where bidders (bribers) have single unit demand. In this auction, the bureaucrat is the seller of k units of the subsidized input and the k-highest bidders (bribers) get the subsidized input. Rents that accrue from the subsidy are the equivalent of the value, v, a bidder (a firm) attaches to the auctioned object (in this case the subsidy). Thus $v_i = \alpha_i(x^m - x^s)$, with the common support $[\underline{v}, \overline{v}] = [\underline{\alpha}(x^m - x^s), \overline{\alpha}(x^m - x^s)]$. The rents value v is increasing in the cost type α. Its distribution, $F(v)$, is a scaled distribution of α . This game is equivalent to a discriminatory auction since each briber pays the bribe he offers and the k-highest bribers get the subsidized input.

Lets restrict attention to symmetric equilibrium and appeal to the assumption that the bribe function, $\beta_i(v)$, is a strictly monotonically increasing function of the cost type (or equivalently the value of the subsidy to the briber). Then the probability of firm i getting the subsidized input is the probability of exceeding the order statistic Y_l^{n-1}, where $l = n-k$. The superscript $n-1$ emphasizes that the sample size for the order statistic is $n-1$ (i.e. the number of all other firms in the game excluding i) instead of n (the number of firms

in the game).

I illustrate this for firm 1 of cost type α_1, hence rents value v_1, offering a bribe b. Suppose that all firms $i \neq 1$ follow the symmetric equilibrium $\beta^*(v)$ which is increasing and differentiable in v. Firm 1 gets the subsidized input only if $b > \beta_l(v)$, where $\beta_l(v)$ is the l^{th} ranked bribe when bribes of the other $n-1$ firms are ranked in ascending order. Since $\beta(v)$ is increasing, firm 1 wins whenever $\beta(v_l) = \beta(Y_l^{n-1}) < b$, where v_l corresponds to the rent value to the l^{th} ranked cost type (also ranked in ascending order such that the highest cost type firm has the highest rents valuation for the subsidy). Thus firm 1 wins whenever $Y_l^{n-1} < \beta^{-1}(b)$. Define $G(y_r)$, the probability distribution of the order statistic Y_r^{n-1} with the density function $g(y_r)$. After substituting for $v = \beta^{-1}(b)$, the probability of success of a bribe b is given by (2.5) [6].

$$\phi(b) = G(v) = \int_{\underline{v}}^{v} \frac{(n-1)!}{(l-1)!(k-1)!} f(z)[1-F(z)]^{k-1}[F(z)]^{l-1}dz \tag{2.5}$$

We now turn our attention to characterizing the optimal bribe function in a symmetric equilibrium.

Lemma 1 The case of kickbacks - *If bribes are reimbursed to losers, there is a symmetric equilibrium with the following optimal bribery strategy*

$$\beta^*(v) = \frac{\int_{\underline{v}}^{v} zf(z)[1-F(z)]^{k-1}[F(z)]^{l-1}dz}{\int_{\underline{v}}^{v} f(z)[1-F(z)]^{k-1}[F(z)]^{l-1}dz} = E[Y_l^{n-1}|Y_l^{n-1} < v] \tag{2.6}$$

Proof. This is a direct application of Krishna's (2002) solution for a multi-unit first-price auction with a single-unit demand. The expected surplus for firm i is

$$\pi_i = G(\beta^{-1}(b))[v-b] \tag{2.7}$$

The first order condition for maximizing the expected payoff[7] with respect to b is

$$(v-b)\frac{g(\beta^{-1}(b))}{\beta'(\beta^{-1}(b))} - G(\beta^{-1}(b)) = 0 \tag{2.8}$$

[6] The density of a r^{th} order statistic y_r from a random sample of size N with a pdf $f(v)$ is $g(y_r) = \frac{N!}{(r-1)!(N-r)!} f(v)[F(v)]^{r-1}[1-F(v)]^{N-r}$. For the briber to win, he has to beat the l^{th} ranked bribe from the remaining $n-1$ firms hence the sample size is $n-1$ and $r = l$ thus $N - r = k - 1$ since $n = k + l$

[7] The firm faces a participation constraint that $\pi_i \geq 0$. However the participation constraint is not binding for all other cost type except the lowest cost type. This is a standard outcome in symmetric equilibria. All bidders other than the one with the lowest valuation (who doesn't bid) make positive bids.

Multiplying by $\beta'(\beta^{-1}(b))$ and taking into account that at a symmetric equilibrium $b = \beta(v)$ and that $\beta(\underline{v}) = 0$, the first order condition can be expressed as a differential equation in (2.9) whose solution is given in equation (2.10).

$$\frac{d}{dv}[G(v)\beta(v)] = vg(v) \tag{2.9}$$

$$\beta(v) = \frac{1}{G(v)}\int_{\underline{v}}^{v} zg(z)dz = v - \frac{1}{G(v)}\int_{\underline{v}}^{v} G(z)dz \tag{2.10}$$

From equation (2.10), the bribe function is the expected rents (value) of the l^{th} ranked bribe from the $n-1$ remaining firms conditional on that value being less than firm 1's rents(valuation). Substituting for $G(v)$ in 2.10 using (2.5) yields the expression given by (2.6).

To prove that $\beta^*(v)$ is indeed the symmetric equilibrium, it suffices to show that there is no gain from deviation for a player $j \neq i$ with value v_j, when all the other players play strategy $\beta^*(v)$ in equation (3). I refer to the proof by Krishna (2002)[pp17-18] since the arguments are exactly the same. A similar proof is provided for lemma 2 below. ■

Intuitively, a firm can win for certain if it offers a bribe higher than the l^{th} ranked rents value. This is only profitable if that bribe is less than its own rents value, otherwise the firm is better off without bribing. Note that a firm does not offer a bribe greater than or equal to its valuation. Assuming it does, then its payoff is zero irrespective of whether it loses or wins. If it offers a bribe less than its valuation, it gets a positive payoff if it wins and zero if it loses. Therefore its expected payoff is greater than zero. Consequently offering a bribe equal to one's valuation is a weakly dominated strategy while offering a bribe greater is strictly dominated. Since the l^{th} ranked firm never bids its own valuation, a weakly dominant strategy for any firm is to offer the expected value of the l^{th} ranked rents value conditional on it being less than the firm's own rents valuation.

Lemma 2 The case of entry costs - *If bribes are not reimbursed to losers, the game is equivalent to an all pay auction (i.e. a discriminatory auction in which all bidders pay their bids) whose symmetric equilibrium bribe function is*

$$\widehat{\beta}(v) = vG(v) - \int_{\underline{v}}^{v} G(z)dz \tag{2.11}$$

where $G(v)$ is as defined in (2.5)

Proof. This too is a simple extension of a single unit all pay auction to a multiple unit case with single-unit demand. The expected profits for firm i are

$$\pi_i = vG(\beta^{-1}(b)) - b \tag{2.12}$$

The first-order condition for maximizing expected surplus with respect to b is

$$vg(\beta^{-1}(b)) = \beta'(\beta^{-1}(b)) \tag{2.13}$$

Also noting that in symmetric equilibrium $b = \beta(v)$, the first order condition can be expressed as a differential equation in (2.14)

$$\beta'(v) = vg(v) \tag{2.14}$$

This differential equation implies that the slope of the bribery function depends on the density function $g(v)$. This slope is positive since by definition, both v and $g(v)$ are positive. If rents are bounded above by $\overline{v}$ and $g(v) \to 0$ as $v \to \overline{v}$, the bribe function will become flatter as $v \to \overline{v}$ and reaches a maximum at $\overline{v}$. In this case, the firm with the highest valuation (the highest cost type) will pay the highest bribe.

Solving for (2.14) using the fact that $\beta(\underline{v}) = 0$ and integrating by parts, we get the equilibrium bribe function given by (2.15), where $G(v)$ is as defined in (2.5)

$$\widehat{\beta}(v) = vG(v) - \int_{\underline{v}}^{v} G(z)dz \tag{2.15}$$

To prove that $\widehat{\beta}(v)$ is the symmetric equilibrium, it suffices to show that there is no gain from deviation for a player with value v, when all the other players play the strategy given by (2.11). I now show that any bribe offer $b \neq \widehat{\beta}(v)$ will lower the firm's expected profits. Define $w = \widehat{\beta}^{-1}(b)$ i.e. the rent value for a firm that would offer bribe b in equilibrium, then firm j's expected profits $\pi(b, v)$ are given by (2.16) after substituting for $b = \widehat{\beta}(w)$.

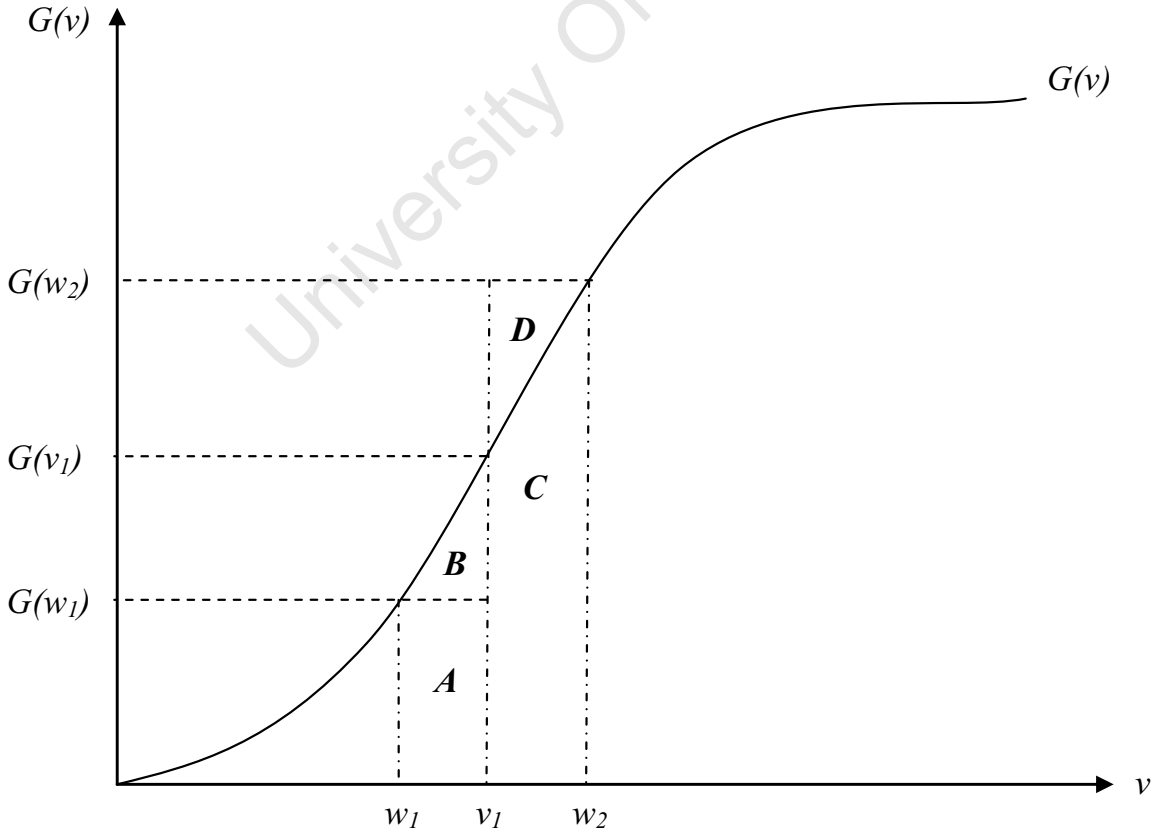
$$\pi(\widehat{\beta}(w), v) = vG(w) - wG(w) + \int_{\underline{v}}^{w} G(z)dz \tag{2.16}$$

Since $\pi(\widehat{\beta}(v), v) = \int_{\underline{v}}^{v} G(z)dz$, we have

$$\pi(\widehat{\beta}(v), v) - \pi(\widehat{\beta}(w), v) = (w - v)G(w) + \int_w^v G(z)dz \geq 0 \tag{2.17}$$

When $w > v$, $(w-v)G(w) > 0$ and $\int_w^v G(z)dz < 0$ but less than $(w-v)G(w)$ in magnitude hence the above expression is positive. When $w < v$, $(w-v)G(w) < 0$ but $\int_w^v G(z)dz > 0$ is greater in magnitude, thus the above expression is positive. This is illustrated in figure 2.1. for a firm with valuation v_1. Note that $(w-v)G(w)$ is the area of a rectangle with width $(w-v)$ and length $G(w)$ while $\int_w^v G(z)dz$ is the area under the $G(z)$ curve with a lower and upper bound of v and w respectively. Offering a bribe higher than $\widehat{\beta}(v_1)$ is illustrated as a bribe offer of $\widehat{\beta}(w_2)$ where $w_2 > v_1$. Thus the area $(w_2 - v_1)G(w_2) = C + D$ and $\int_{w_2}^{v_1} G(z)dz = -C$ therefore $(w_2 - v_1)G(w_2) + \int_{w_2}^{v_1} G(z)dz = D \geq 0$. Offering a bribe greater than $\widehat{\beta}(v_1)$ reduces the expected surplus by D in this case. Offering a lower bribe is illustrated as an offer of $\widehat{\beta}(w_1)$ where $w_1 < v_1$. In this case $(w_1 - v_1)G(w_1) = -A$ and $\int_{w_1}^{v_1} G(z)dz = A + B$ therefore $(w_1 - v_1)G(w_1) + \int_{w_1}^{v_1} G(z)dz = B \geq 0$. Thus offering a

Figure 2.1. Illustration of losses from deviation from the optimal bribery strategy



bribe lower than $\widehat{\beta}(v_1)$ will reduce the expected surplus by B. This shows that deviating from $\widehat{\beta}(v)$ by either offering a higher or lower bribe has no beneficial gain. Thus $\widehat{\beta}(v)$ is a symmetric Bayesian Nash equilibrium. ■

Also note that a firm will not offer a bribe $b > \widehat{\beta}(v)$ since it will increase the chances of getting the subsidy but will certainly pay more for it. Reducing its bribe offer will increase its expected profits. Thus a firm will offer a bribe $b \leq \widehat{\beta}(v)$. However, we have shown that offering a lower bribe does not increase expected profits either. As such (2.15) is the symmetric Bayesian Nash equilibrium.

Corollary *In the above bribery game, firms reveal their cost types*

Proof. Follows from the above analysis that firms don't have an incentive to deviate. Since firms' values are uniquely determined by their cost types, the above proof essentially implies that a firm has no incentive to mimic another cost type ■

In the symmetric equilibrium, high cost firms offer higher bribes and receive the subsidized input. To see this clearly, the first order condition of (2.12) is expressed as

$$\alpha_i(x^m - x^s)\frac{d}{db}G(\beta^{-1}(b)) = 1 \tag{2.18}$$

Increasing the size of the bribe has two offsetting effects. It increases the probability of getting the subsidy hence increases expected rents but it increases the amount a firm pays for these rents as well. The first order condition in (2.18) implies that an optimal bribe offer equates the marginal benefit of the bribe (i.e. the increase in expected benefit from bribery which is the LHS of (2.18)), to the marginal cost of bribery (RHS). For the same bribe offer, high cost types have higher marginal benefits. Since marginal costs are the same for all cost types, this implies that high cost types will offer higher bribes in a symmetric equilibrium.

Proposition 1 *In a bribery game in which rents are higher for inefficient firms, they pay higher bribes and are awarded the subsidized input ahead of low cost firms. The least cost firm always buys the input at the market price* [8].

Proof. Follows from the bribery strategies from lemmas 1 and 2 . Consider the first

[8]This analysis takes revenue as given while implying coexistence of high and low cost firms. This is plausible when firms are price takers otherwise there is room for the low cost firm to undercut. Under perfect competition this coexistence holds only in the short run since all firms earn normal profits in the long run hence high cost firms will be pushed out. A compeling case can however be made for commodity producers in a small country case. In this case, coexistence of high and low cost producers is permissable even if firms are price takers.

order condition of (2.12) as presented in (2.18) for firms 1 and 2 of cost types α_1 and α_2 respectively. The implication of (2.18) is that at the optimal bribe offer b_i,

$$\alpha_1(x^m - x^s)\frac{d}{db_1}G(\beta^{-1}(b_1)) = \alpha_2(x^m - x^s)\frac{d}{db_2}G(\beta^{-1}(b_2)) \tag{18a}$$

$\alpha_1 > \alpha_2$ thus implies that $\frac{d}{db_1}G(\beta^{-1}(b_1)) < \frac{d}{db_2}G(\beta^{-1}(b_2))$. Since $b_i = \arg\max_b\{\pi_i = vG(\beta^{-1}(b))-b\}$, the second order condition for a local maximum requires that $\frac{d^2}{db_i^2}G(\beta^{-1}(b_1)) < 0$. Hence $\alpha_1 > \alpha_2$ implies that $b_1 > b_2$, otherwise b_i does not maximize the surplus from bribery. However, the proof of lemma 2 which also applies for lemma 1, has shown that $b_i = \widehat{\beta}(v_i)$ maximizes the surplus from bribery. Therefore high cost type firms offer higher bribes than low cost types in equilibrium. Note from the bribery strategies from lemmas 1 and 2 that the lowest cost type firm does not bribe. It always buys the input at the market price. ■

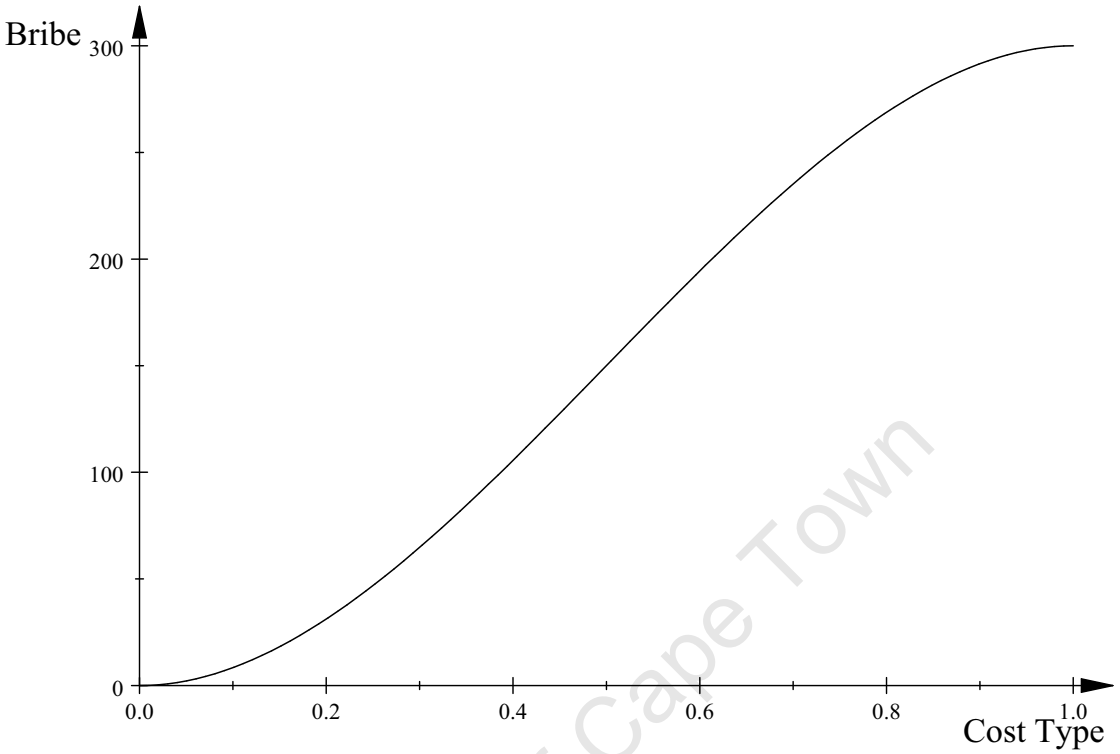
The proposition implies that competitive bribery for an input subsidy leads to an inefficient outcome. This is an apparent contradiction to the general conclusion that competitive bribery does not lead to loss of allocative efficiency. The contradiction derives from differences in the source of rents assigned to the auctioned commodity in different models. In models applied to procurement/contracting, the rents are derived from the value of contracts such that low cost firms have higher profits. As a result, low cost firms pay a higher bribe and get the contract. On the other hand, rents from input subsidies are higher for inefficient producers. They pay higher bribes and get the subsidized input while more efficient producers get the input at the market price, hence the contradiction.

An illustration of the optimal bribe functions is made in two examples below. The first assumes uniform cost types. This implies a society in which the cost types of firms are evenly distributed across $[\underline{\alpha}, \overline{\alpha}]$. The second example mimics a society with a higher concentration of inefficient firms. It uses cost types drawn from a beta(4,2) distribution with a common support $[\underline{\alpha}, \overline{\alpha}]$.

2.3.2 An illustration with uniformly distributed cost types

When the cost type has the standard uniform distribution, the rents value will be uniformly distributed on $[0, \overline{v}]$ where $\overline{v} = (x^m - x^s)$. For expositional clarity, consider the case of 3 firms and 2 units of the subsidized input. The probability of a bribe being successful in this case is

Figure 2.2. Equilibrium bribe function with uniform cost types



$$G(\beta^{-1}(b)) = \int_0^v 2\frac{\overline{v}-z}{\overline{v}^2}dz = \frac{2\overline{v}v - v^2}{\overline{v}^2} \text{ and } \int_0^v G(z)dz = \frac{3\overline{v}v^2 - v^3}{3\overline{v}^2} \tag{2.19}$$

Substituting (2.19) into (2.11), the equilibrium bribe function when bribes are not reimbursed[9]is given in equation (2.20)[10]. This function is plotted on figure 2.2 for a subsidy of \$900.

$$\widehat{\beta}(v) = \frac{3\overline{v}v^2 - 2v^3}{3\overline{v}^2} \tag{2.20}$$

Note that the highest bribe is $\frac{1}{3}(x^m - x^s)$. This is offered by the highest cost type. Bribery

[9]The illustration focuses on this case since a priori, it imposes entry costs to firms. Kim (2000) notes that entry costs are a more prevalent form of corruption in LDCs. Also, the bribe taker prefers not to reimburse bribes in a one shot game.

[10]When the cost type is uniformly distributed in the range $[\underline{\alpha}, \overline{\alpha}]$, the rents are uniformly distributed on $[\underline{v}, \overline{v}]$. Thus $G(v) = \int_{\underline{v}}^{v} 2\frac{\overline{v}-z}{(\overline{v}-\underline{v})^2}dz = \frac{-(v-\underline{v})(v+\underline{v}-2\overline{v})}{(\overline{v}-\underline{v})^2}$;

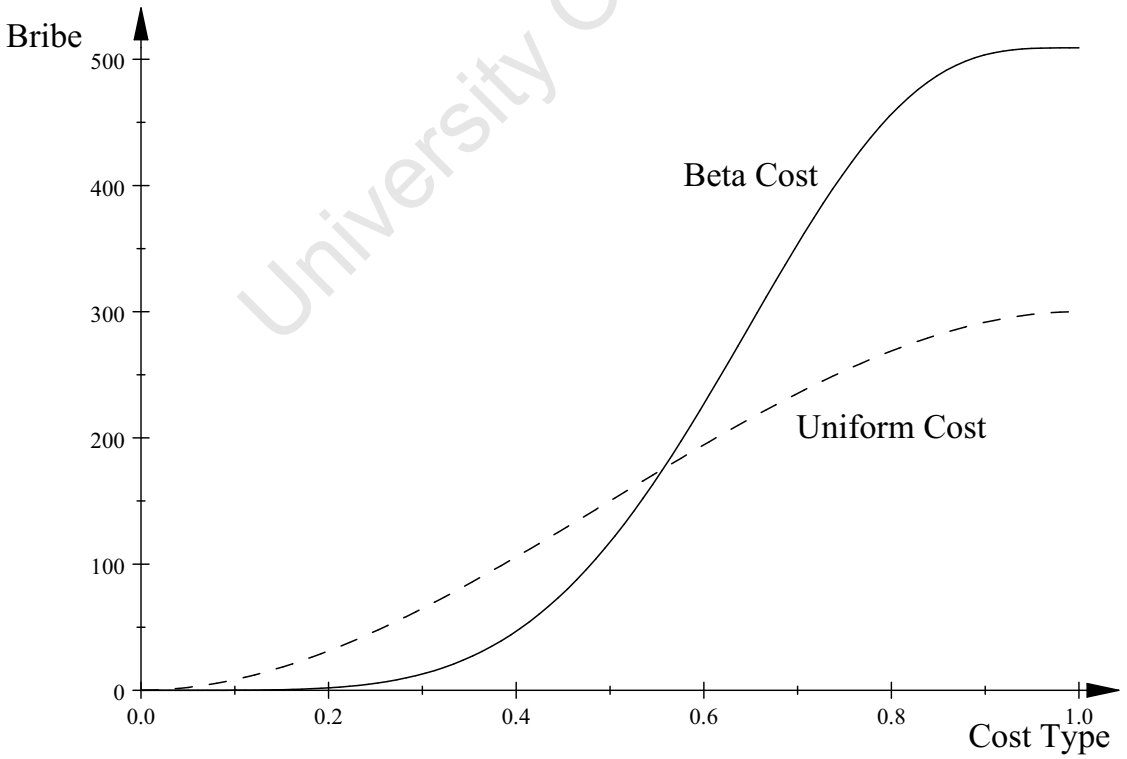
$\int_{\underline{v}}^{v} G(z)dz = \frac{-(v-\underline{v})(v+\underline{v}-2\overline{v})}{(\overline{v}-\underline{v})^2}$ and the optimal bribe function is $\frac{3\overline{v}v^2-2v^3}{3\overline{v}^2}$ which gives a highest bribe offer of $\frac{1}{3}(x^m - x^s)$ corresponding to the highest cost type

offers positive expected rents since firms never offer bribes equal to their rents. The highest cost firm offers the highest bribe equal to a third of the subsidy thus generating rents which are two thirds of the subsidy in this example. While allocation using bribery awards the subsidy to the firm that get higher rents, it does not allocate to firms that use the subsidy to the greatest benefit to society. Instead, the allocation promotes inefficiency.

Comparison with a different distribution

The effect of changing the composition of firms by increasing the proportion of inefficient firms in the game is analyzed below. A comparison to the outcome obtained when the cost types are uniformly distributed is also made. Lets assume that the cost type now has p.d.f $f(\alpha)$ where f is a beta$(4, 2)$ distribution. The cost type is now skewed to the left and $E(\alpha) = \frac{2}{3}$ compared to $\frac{1}{2}$ for the uniform distribution with $\alpha \in [0, 1]$. The bribe function when the cost type follows a beta(4,2) distribution is shown in figure 2.3 alongside the bribe function when costs are uniformly distributed. The mathematical expression is

Figure 2.3. Comparison of bribe functions-uniform vs beta cost types



provided by equation (2.28) in appendix 2.B.

As shown in the diagram, skewing the cost type to the left (i.e. a concentration of less efficient firms in the game) reduces the bribe payment by low cost firms while it increases bribe payments by high cost firms. This outcome follows from the properties of a beta(4,2) distribution. This distribution has a long left tail. Therefore the marginal distribution of the cost type, hence the marginal benefit of bribery, is very small in the left tail. Since the optimal bribe equates the marginal cost to marginal benefit, a smaller bribe will be optimal in the left tail i.e. low cost firms offer low bribes.

On the other hand, the marginal benefit of bribery is very high in the upper tail hence firms have an incentive to offer high bribes. Consequently, high cost firms offer higher bribes than when the cost type is uniformly distributed. Thus the bribe function for high cost firms when the cost type has a beta(4,2) distribution is above the bribe function when cost types are uniformly distributed. Ultimately, high cost firms win the subsidy but pay more for it, while some low cost firms pay lower bribes but still purchase the input at the market price.

2.4 Discussion

The above analysis shows that in a symmetric equilibrium, competitive bribery allocates the subsidy to firms which obtain higher rents from the subsidy. This outcome is consistent with a typical result in auction theory that bidders with the highest valuation win the auctioned object whenever the bidding strategy is symmetric. Whether the allocation is socially optimal depends on the alignment of rents valuations to society's preferences. If the rents valuation coincides with society's preferences, a socially optimal outcome ensues, otherwise the outcome will be suboptimal. For example, in the fixed price contract game, rents are higher for low cost firms and society also prefers an allocation to the lowest cost firms. The outcome from competitive bribery is thus efficient.

In contrast, an input subsidy generates higher rents to inefficient firms (high cost producers) who then offer higher bribes and win the subsidy yet society prefers an allocation to low cost firms. Therefore, allocation through competitive bribery is not socially optimal for the case of an input subsidy analyzed above. Inefficient producers get the subsidized input at the expense of more efficient producers in this case. Using this result, combined with Lien's (1990) result showing inefficient allocation in the case of asymmetry due to bribe discrimination, I make the following claim:

Claim *Competitive bribery under incomplete information is only efficient under the following conditions: i) Bribers have a common information set and share common beliefs, ii) The bribee allocates the object solely on the basis of the bribe size i.e. there is no bribe discrimination and iii) The bribers' valuation of rents is aligned to society's preferences.*

The first condition in this claim follows from a necessary condition that bidders assume a common distribution of the valuation (the cost type in this case) hence adopt a common probability $\phi(b)$ of winning, in order to obtain a symmetric equilibrium. It follows from the general auction theory result that asymmetric equilibria is inefficient. The second follows from Lien's (1990) result that allocation is inefficient when the bureaucrat discriminates bribes while the third condition follows from the analysis in this paper. This implies that efficient allocation under competitive bribery is a particular rather than a general outcome.

The first two conditions generally do not hold in practice due to favoritism, nepotism, bribe discrimination and other asymmetries. In addition this chapter demonstrated that market distortions generate rents which are misaligned to society's preferences. Since distortions are highly prevalent and a major source of rents too, the following remark based on the above claim, can be made.

Remark *The efficient outcome from competitive bribery models is sensitive to the model set-up, it cannot therefore be generalized.*

Indeed, it is easier to think of circumstances in which competitive bribery is inefficient. Kaufmann (1997) gives an example of India where firms, after realizing that junior officials cannot facilitate faster processing of their documents, pay them to further delay the processing of rivals' documents instead. A similar inefficient outcome can be envisaged from Grossman and Helpman (1994). They predict that when some special interest groups can organize and lobby for tariff protection, the political equilibrium that emerges favors protectionism rather than efficient means. These organized groups are likely to be monopolies and oligopolies which are inefficient (see Oslon 1971).

In developing countries, lobbying might take the form of outright bribery of politicians. Firms bribe politicians to obtain legislation that guarantees monopoly rents, higher tariffs in their sectors while advocating for price ceilings in others and purchasing of parastatals below their market values during privatization and indigenization programs. Even if such bribery is competitive, the outcome is unlikely to be efficient.

Considering that i) bureaucrats are more likely to discriminate bribes and preside over multiple contract tenders and ii) bribery for rents from market distortion is widespread,

one should expect bribery to be inefficient even if it is competitive. This is likely the case in licensing for natural resources or cases of favoritism in awarding of large scale public projects. Other examples in which competitive bribery is inefficient includes job selection and the justice system. There is no guarantee that the best qualified candidate is awarded the job if selection is on the basis of bribery nor is there reason to believe that the innocent part will offer a higher bribe to the judge. In fact, it is the least qualified and the guilty who have greater incentives to offer bigger bribes. Thus conditions in reality make inefficient outcomes from competitive bribery more likely. Therefore, the generalization that competitive bribery is efficient is misleading.

2.5 Conclusion

The chapter highlighted the debate on the economic consequences of corruption. It then presented a counter argument to the notion that that competitive bribery is efficient. The chapter applied auction theory to demonstrate that competitive bribery is generally inefficient and that the "efficiency outcome" is sensitive to the model set-up. Using the example of an input price subsidy, it showed that when the valuation of rents is misaligned to society's preference, an inefficient allocation ensues. Competitive bribery is only efficient when there is alignment of rents valuation to society's preferences and bribery strategies are symmetric. Thus conclusions that bribery is efficient are particular rather than general cases in reality. The results of the chapter imply that generalizing the efficiency of competitive bribery is misleading. In fact, competitive bribery is generally inefficient.

The use of rents from input subsidies in this chapter highlights that market distortions attract bribery which leads to losses in efficiency. The bribes are collected by the bureaucrat. So far, a passive bureaucrat who does not set policy has been assumed. If the bureaucrat designs policy or shares bribes with the policy maker according to some institutional arrangement, he and the policy maker have an incentive to act strategically and maximize the appropriation of rents. This entails increasing the magnitude of distortions despite the associated welfare losses. The bureaucrat and policy maker will only care for the welfare losses if they affect the likelihood of continued extraction of rents. Therefore observed distortions are an outcome of the interaction between private bureaucratic incentives and the quality of electoral institutions which determine the likelihood of continued extraction of rents.

A policy maker who cares about continued extraction of rents from market distortions

can only keep his office by maintaining distortions at levels acceptable to a simple majority of voters in a complete democracy. However when democratic institutions are weak, the policy maker has a second instrument at his disposal. This instrument is electoral fraud/manipulation. With an additional instrument at hand, the policy maker is able to extract higher bribes by setting market distortions at higher levels than possible in a complete democracy. This argument is pursued in the next chapter to explain the existence of high distortions.

2.A The general cost function

Assume a total cost function in equation (2.21), where $x \in [x^m, x^s]$, $c_i q_i$ are costs from other inputs and $f(q_i)$ is such that $f'(q_i) < 0$; $f''(q_i) \geq 0$. Thus the cost component of the input X is decreasing in output. This cost function has a $U-$shaped average cost function.

$$TC = c_i q_i + f(q_i)x \tag{2.21}$$

Denote the average cost function by AC, then

$$AC_i = c_i + f(q_i)\frac{x}{q_i} \tag{2.22}$$

$$\frac{d}{dq}AC_i = \frac{f'(q_i)q_i - f(q_i)}{q_i^2} < 0 \tag{2.23}$$

$$\frac{d^2}{dq_i^2}AC_i = \frac{f''(q_i)q_i - f'(q_i)q_i^2 - 2f(q_i)q_i}{q_i^4} \tag{2.24}$$

The derivative in equation (2.24) is positive in the range $[0, \widehat{q_i}]$ where $\widehat{q_i} = \frac{f''(q_i) - 2f(q_i)}{f'(q_i)}$. If firms are price takers, then the first order condition is given in 2.25.

$$p = c_i + f'(q_i)x \tag{2.25}$$

This implies that a low cost firm produces more output in equilibrium. To see this clearly, consider the first order conditions for firm 1 and firm 2 with respective costs types c_1 and c_2 such that $c_1 < c_2$. The first order condition implies that

$$c_2 - c_1 = [f'(q_1) - f'(q_2)]x$$

If $c_1 < c_2$, $f'(q_1) - f'(q_2) > 0$ since $f'(q_i) < 0$, this implies that $f'(q_2)$ is greater in magnitude than $f'(q_1)$. Since $f''(q_i) > 0$, it follows that $q_1 > q_2$ in equilibrium. The corresponding profit function is $\pi(q, x) = pq - cq - f(q)x$ and $\pi_x(q, x) = -f(q) < 0$. A reduction in the price of X increases profits. It is therefore intuitive for government to subsidize the price of input X and prioritize low cost producers when the subsidy cannot cover all firms. However, the increase in profits is higher for the high cost producer than

the low cost producer since $f'(q) < 0$ and the low cost producer's output is higher. The competitive bribery strategies will thus be similar to those discussed in the paper. In fact, the cost function used in the paper is a simple version of this general cost function where $f(q_i) = \alpha$ and one can define $\alpha = \frac{1}{q}$ for example.

2.B Calculating the optimal bribe with beta cost types

Assume that the cost type has a beta distribution over the support $[0, 1]$ such that $f(\alpha|4, 2) = \frac{\Gamma(6)}{\Gamma(4)\Gamma(4)}(1-\alpha)\alpha^3$. The pdf $f(\alpha)$ and cdf $F(\alpha)$ of the cost type are:

$$f(\alpha) = 20(\alpha^3 - \alpha^4) \text{ and } F(\alpha) = 5\alpha^4 - 4\alpha^5$$

It follows that

$$f(v) = 20(\frac{1}{\overline{v}})[(\frac{v}{\overline{v}})^3 - (\frac{v}{\overline{v}})^4] \text{ and } F(v) = 5(\frac{v}{\overline{v}})^4 - 4(\frac{v}{\overline{v}})^5 \tag{2.26}$$

Substituting for these expressions in equation 2.5 and for $k = 2$ and $n = 3$ gives

$$G(\beta^{-1}(b) = G(v) = (\frac{v}{\overline{v}})^4[5 - 4(\frac{v}{\overline{v}})][5(\frac{v}{\overline{v}})^4 + 4(\frac{v}{\overline{v}}) - 2] \tag{2.27}$$

Substituting for $G(v)$ in 2.15 gives the following expression for the bribe function

$$\widehat{\beta}(v) = \frac{4v^5}{99\overline{v}^{10}}(198\overline{v}^6 - 165\overline{v}^5 v - 550\overline{v}^2 v^4 + 891\overline{v}v^5 - 360v^6) \tag{2.28}$$

Chapter 3

Electoral accountability and incentives for market distortions

3.1 Introduction

Market distortions are implemented in varying forms and magnitudes in different countries. The distortions are quite high in some countries leading to high levels of corruption and huge welfare losses, yet they persist over long periods. Among popular explanations of this phenomenon is that market distortions are an outcome of aggregation of private interests by the state. Distortions are a culmination of lobbying from special interest groups in this regard (Bates 1987, Grossman & Helpman 1994). They cannot be reversed once they are implemented (Coate & Morris 1999). A second explanation is based on the political use of economic inefficiency. This suits an autonomous state that dictates policy. In this case, distortions are an outcome of tactical redistribution of excludable benefits by politicians to key constituencies in order to secure political power (Cox & McCubbins 1986, Dixit & Londregan 1996).

These explanations preclude the motive of appropriation of rents from market distortions for private financial gain. They assume that politicians' policy choices are driven only by the need for political control. However, the previous chapter showed that market distortions attract bribes which accrue to people in office. Thus office bearers benefit financially from rent generating distortions. By focusing on political incentives only, explanations based on lobbying and tactical redistribution ignore an important incentive for distor-

tions. They rule out glaring distortions which make an overwhelming majority of voters worse-off because such distortions are political suicide.

However, such glaring distortions are observed in reality. The overvaluation of the Zimbabwean dollar (the black market premium was 24 000% in January 2008 (BBC 2008)) and price controls led to empty shelves and an inflation rate of 100 580.2 % in January 2008 for example (CSO 2008). Yet these distortions persisted. At the same time, the Reserve Bank of Zimbabwe (RBZ) spent USD25 million, financed from inflation, on an agriculture mechanization programme that offered free agricultural implements to farmers. Only people in positions of influence benefited from this programme at a greater cost to society (Reserve Bank of Zimbabwe 2006). A similar situation was experienced in Zambia towards the end of former President Kaunda's reign and in East-European countries during late 80s. In these examples, policy choices resulted in intolerable levels of corruption and welfare losses which cannot be justified on the basis of attracting voters. There should be another motive for their existence.

These distortions were sustained for the financial rents they brought to office bearers. Models of electoral accountability take into account financial rent seeking motives of policy makers. They predict that policy makers extract rents up a level just acceptable to a simple majority. This prediction implies that a majority of voters in countries with high distortions like Zimbabwe, find them acceptable despite huge welfare losses such distortions impose. This is implausible since rioting takes place in most countries with such distortions. An alternative explanation to the existence of high distortions is needed. It is offered in this chapter.

The existence of high distortions is attributed to the maximization of appropriation of rents from market distortions by self enriching policy makers when electoral institutions are weak. Market distortions generate rent seeking opportunities. Higher distortions bring greater financial benefits to the incumbent through corruption. However, high market distortions and subsequent welfare losses they bring increase political pressure. When electoral institutions are strong, the incumbent faces full political pressure brought by welfare losses from high distortions. He faces binding political constraints hence he distorts less. If electoral institutions are weak, the incumbent can easily manipulate the electoral process. The incumbent is insulated against any political pressure arising from the welfare losses from market distortions. He is able to maximize on financial rents by raising the levels of distortions. Therefore high distortions are attributable to poor electoral institutions which erodes electoral accountability. This enables self enriching policy makers to have their cake and eat it too.

This argument is confirmed by empirical evidence on exchange rate overvaluation in Sub-Saharan Africa during 1980- 1998. The results show that on average, complete dictatorships will overvalue by between 22.4 and 26.6 percentage points more than complete democracies with similar economic characteristics. It is found that exchange rates are less likely to be overvalued in democratic regimes than in autocracies. This explains high distortions in a country like Zimbabwe between 2000 and 2009. The chapter is organized as follows: Section 3.2 reviews the literature on politics and policy choice. Section 3.3 outlines the theoretical model. Section 3.4 empirically tests the theory on exchange rate overvaluation in Sub–Saharan Africa. Section 3.5 discusses the findings and relates them to events in Zimbabwe. Section 3.6 summarizes the findings and concludes the chapter.

3.2 Politics and policy choice – A review

Governments sometimes introduce suboptimal policies that persist over time. Various arguments have been made in an attempt to explain these policies. The first assumes that policy makers seek policies that maximize social welfare. Inefficiencies are not intentional but simply a result of a single institution attempting to pursue multiple and often counteracting objectives. This kind of assumption is inherent in the discretion versus rules literature (Kydland & Prescott 1977, Barro & Gordon 1983, Rogoff 1985, Alesina & Tabellini 1987). The policy maker's objective function and the social welfare function are the same in most of these cases. Nevertheless, active policy manipulation leads to an inflation bias although the policy makers' objective is noble.

Other examples have been mentioned in Bates (1987). It is often highlighted that price controls in agriculture were meant to promote industrialization by providing cheap inputs and reducing the cost of labor for the industrial sector. Exchange rate overvaluation could be seen as an attempt to reduce the cost of importing critical intermediate goods and essentials like oil while high tariffs are an attempt at infant industry protection. Thus whatever negative impact such policies have on welfare, they are initially made to improve it. If this were the case, one expects policy reversals once the negative effects of the policy become apparent.

The second explanation is found in models of special interest groups. It is assumed that policy makers care only about political power. Their policy choices are meant to maximize political gain. They respond mainly to organized groups' concerns since these are a major source of campaign funds necessary for securing political power. A clear exposition is

made in Grossman & Helpman's (1994) "protection for sale" paper. They set up a model in which special interest groups lobby for protection by offering political contributions to the incumbent government. Protectionism reduces welfare of people but the incumbent needs the funds for campaigning to win people's vote. Thus the incumbent government has to choose a policy that maximizes its welfare which is a function of contributions and welfare of people. They show that when some groups can lobby while others don't, the incumbent chooses a trade policy that protects the lobbyist. It is also shown that lobbies may prefer inefficient means of transfers (i.e. protectionism) than efficient means.

According to this argument, economic policy is driven primarily by the agenda of special interest groups. This has been applied to the determination of the exchange rate regime in literature on the political economy of exchange rates (Hefeker 2000, Broz & Frieden 2001). It is argued that observed exchange rate regimes or levels are determined by special interest groups through their political influence rather than overall economic merit. This can be illustrated in the choice between exchange rate stability through pegging versus monetary flexibility. The tradeables sector prefers exchange rate stability while the non tradable sector prefers monetary flexibility. The two sectors lobby for their interests. Similarly exporters and import competing industries would lobby for a depreciation while importers lobby for an appreciation.

A practical example is demonstrated in the endogenous switching of the exchange rate regime in Korea (Kim & Kim 2005). Kim & Kim argue that exchange rate regime switches are an endogenous outcome of bureaucratic incentives derived from special interest groups. Bureaucrats derive benefits from lobbying by special interest groups who have differing preferences on the level of the exchange rate. The special groups are primarily concerned about the level of the exchange rate rather than the regime. However, manipulating the exchange rate is costly to the bureaucrat. The cost, both political and financial, varies with the exchange rate regime. The bureaucrat chooses a regime that minimizes the cost of exchange rate manipulation in response to benefits from special interests given constant flows of lobbying funds across regimes.

Kim & Kim (2005) test this argument on the regime switch to the market average regime (MAR) in 1990 by Korea. Their first model results show that both export and import pressure groups significantly influenced the exchange rate. Their second model supports the argument that changes in the political landscape (i.e. an increase in electoral accountability) in the late 1980s increased the political cost of manipulating the exchange rate to accommodate special interests. This led to a switch from the fixed exchange rate to the MAR.

A lot of emphasis in these models is placed on organized groups or ability to organize and neglects large unorganized groups. This underestimates the power of unorganized groups' votes as reward or punishment for good behavior (Wittman 1989, Arnold 1990). Since groups are first movers, the models also imply a subordinate state (Rodrick 1992). Market distortions are a result of the incapacitation of the subordinate state by special interest groups in this context. This is not applicable in an autonomous state which dictates policy and private agents respond to that policy. This leads us to the third line of argument to explain choices of economic policies.

This third explanation explores the political use of economic inefficiency. The policy maker is motivated by political control and he is the first mover, setting policy strategically to induce groups to conform to his intentions. Therefore, politicians may choose inefficient economic policies for political control (Bates 1987, Cox & McCubbins 1986, Dixit & Londregan 1995, Dixit & Londregan 1996, Coate & Morris 1999). They use excludable and often inefficient transfers to benefit key constituents- either core supporters in some models or swing voters in others.

Dixit & Londregan (1996) provides a general framework for explaining redistributive politics. They argue that pork-barrel politics emanates from voters' willingness to compromise on their principles for particularistic voting. Increasing transfers to one group happens at the expense of higher taxes to another. Although a party can fully tax, transfers that reach particular groups have leaks. These leaks vary from group to group and may differ systematically from one party to another. Voters have party affinities but also care about excludable particularistic benefits. There are two parties (R and L) with fixed ideological positions. Voters comprise identifiable groups which can be distinguished by some particular characteristic e.g. occupation. Heterogeneity on party affinity within each groups' voters is permissible but there are systematic differences on party affinities within groups. A voter with affinity for R in group i may vote for party L if utility from $L's$ redistributive policy exceeds that from party R by some threshold level X_i.

Different groups will have different thresholds and responsiveness to changes in consumption, hence different responsiveness to redistribution policies. The model generates either a swing voter or core voter outcome depending on the underlying conditions. When parties can redistribute benefits with equal abilities to different groups, a swing voter outcome ensues. Groups with relatively many moderates, more indifferent to party ideology relative to particularistic gains or that have high marginal utility of income hence more likely to compromise, are the target of redistributive politics. On the other hand, a core voter outcome ensues when parties differ in their ability to extract taxes and deliver benefits to

different groups. Parties target benefits to their core constituencies in this case.

The above theory implies that distortions are a tool for attracting support from certain constituencies. Politicians thus distort not for private financial gain, but only to attract votes from certain constituencies. Bates (1987) points to underpricing of agriculture commodities in countries with urban-political bases as a good example. Another example includes underpricing in share issue privatization in mass privatizations by the right to enlist support from the left (Boycko, Shleifer & Vishny 1994, Schmidt 2000, Biais & Perotti 2002)[1]. This argument excludes private financial benefits to politicians themselves. Consideration for private financial gains may be the underlying motive behind underpricing of state enterprizes in Africa. Craig (2000) observed that some branded Zambia's privatization as a looting exercise for example.

Models of lobbying and tactical redistribution cannot explain distortions that bring large welfare losses to a majority of voters. Such distortions will push this majority to the opposition leading to electoral defeat in a complete democracy. Limiting politicians' incentives only to securing political control thus rules out any distortions that are obviously detrimental to the majority voters. Therefore, excessive distortions that we sometimes observe are inconsistent with pure desire for political control. An adequate theory should thus capture other incentives and institutional arrangements that permits the existence of excessive distortions which benefit only a few. The next section offers an alternative argument which extends the politicians' incentives to include private financial benefits in a weak institutional environment.

3.3 A model of bureaucratic incentives

I intend to model an incumbent who designs an inefficient policy for private financial gain first and foremost but benefits specific groups to appease them and ensure political control in a weak institutional environment. A model of electoral accountability emerges as a natural option for analyzing the incumbent's financial incentive to distort. Once in power, office bearers have monopoly power to allocate resources. Left alone, self interest dictates the use of this power to their own ends at great cost to society. There is a moral hazard involved which can be controlled through electoral accountability (Persson, Roland & Tabellini 1997).

[1]See also Kim & Kim (2007) on the choice of the discount window instead of open market operations. Although inefficient (Poole 1993) the discount window ensues political control. Also see Clark & Hallerberg (2000) on how political control influences the decision on central bank independence

Ferejohn (1986) proposed an electoral model in which voters evaluate, then reward or punish office bearers on the basis of actual performance while in office. This motivates office bearers to please the electorate. This is inherent in traditional political business cycle literature based on either retrospective voting (pioneered by Nordhaus 1975) or rational voters with imperfect information about the incumbent's competence (Rogoff & Sibert 1988, Rogoff 1990). In these models, the incumbent undertakes opportunistic behavior either to please retrospective voters or to signal his competence if voters are rational. In short, the incumbent believes that his current performance influences the political outcome.

Empirical evidence of active policy manipulation in electoral years in both developed countries (Alesina 1987, Nordhaus 1989, Alesina, Cohen & Roubini 1992, Drazen 2000) and developing countries (Schuknecht 1996, Block 2002, Dreher & Vaubel 2004, Shi & Svensson 2006) suggests that politicians believe in electoral accountability. A reinforcing finding is that good economic conditions help keep incumbents in power (Nannestad & Paldam 1994, Price 1997, Gelineau & Remmer 2006). This suggests that to some extent, voters hold politicians accountable for their performance while in office.

A model of electoral accountability best captures the political behavior in Africa and other developing countries. In developing countries, elections normally serve as referenda of incumbent governments' performance (Ka & van de Walle 1994, Block 2002). Ideological partisan differences in terms of right and left are also less clear cut in developing countries (Shi & Svensson 2003). Consequently, politicians typically make policies that maximize political survival based on their perceptions on political risk associated with given policies. This justifies the use of an electoral accountability model in this paper.

Some models have used an electoral accountability framework to merge politicians' private financial and political motives for rent seeking (Coate & Morris 1999, Persson & Tabellini 2000, Aidt 2003). However, they fail to encompass some critical issues. These models assume a mature democracy (or more generally strong institutions) such that voters are fully able to express their displeasure into votes against the incumbent. Since electoral accountability is rendered ineffective in immature democracies or weak institutional environments, politicians face smaller trade-offs for their rent seeking activities. Failure to take the quality of institutions into account issues is likely to understate the level of distortions that politicians choose.

Electoral accountability models implicitly assume a representative voter or that all voters coordinate on a particular voting rule. However, large groups' inability to coordinate is well documented. This feature makes voter accountability a more powerful mechanism

for controlling politicians than observed in practice. In addition the models overlook the importance of special groups politics for either influencing the policy or their use in maintaining political control. However, Potters & Sloff (1996) note from literature that special interest groups influence politicians policy choices on specific and narrow issues that bring concentrated benefits but whose costs are widely distributed. The model below takes these issues into account.

3.3.1 The model

Consider an economy with a presidential system where power is concentrated in a single individual. The incumbent considers the possibility of intervening in markets for the purposes of rent seeking. Distortions of magnitude d generate rents $r(d)$ where $r'(0) > 0$ and $r''(d) < 0$. These distortions reduce welfare by $w(0) - w(d)$, where $w(0)$ is the welfare without intervention and $w(d)$ is welfare under intervention. The politician is fully aware of the negative welfare effects of the distortions and that excessive welfare loses increase political pressure–possibly leading to an electoral defeat. The incumbent thus faces a trade-off between raising rents in the current period and reducing the probability of re-election thereby reducing expected future rents.

Voting rule

Voters consider the incumbent (policy maker) and the opponent as identical in all respects. They use their votes to punish the incumbent for excessive loss of welfare by voting him out, or rewarding him for good behavior by keeping him in office. They vote the incumbent out whenever welfare loses exceed their respective threshold points. Formally put, voter i will vote the incumbent out when $w(0) - w(d) > X_i$ where $X_i \geq 0$ is voter i's threshold for tolerable loss in welfare. This allows for differences in threshold points among voters so they need not coordinate on a particular voting/punishment rule. Voter coordination has been a bone of contention with electoral accountability models. Also, such a specification can accommodate partisan politics. In which case X_i reflects voter i' s sympathy or affinity for the incumbent. Thus the probability of voter i voting for the incumbent is given by (3.1), where $F(x) \equiv F(w(0) - w(d))$ is the cumulative density of X_i.

$$\Pr(w(0) - w(d) \leq X_i) = 1 - F(x) \tag{3.1}$$

In the strictest sense, $F(x)$ should be a probability conditioned on all other factors (state of affairs) that affect voter decisions but are not directly analyzed here. This voting rule is consistent with the notion that voters vote on the overall economic performance instead of personal circumstances (Lewis-Beck 1988, Nannestad & Paldam 1994). The greater is the welfare loss caused by the distortion, the lower the reelection prospects of the incumbent.

When institutions are weak, the incumbent can mitigate against electoral pressure by devoting a portion of his rents, c, to manipulating the electoral process. The incumbent's success at manipulating the electoral process is given by a function $\lambda(c)$, where $\lambda(0) = 0$, $\lambda'(c) \geq 0$, $\lambda''(c) \leq 0$ and $\lim_{c\to\infty} \lambda(c) = 1$. Spending on electoral manipulation increases the chances of winning the election, but at a decreasing rate, such that an incumbent will have to devote an unlimited amount of resources to be absolutely assured of victory. Thus $0 \geq \lambda(c) \leq 1$, noting that $\lambda(c) = 0\ \forall c$ implies that electoral manipulation is completely ineffective, as with the case of very strong institutions. For two countries, a and b, $\lambda_a(c) > \lambda_b(c)\ \forall c$ implies that it is easier to successfully manipulate elections in country a than in country b.

Electoral manipulation is modeled as the alteration of the voting rule in (3.1) to become (3.2). Equation (3.2) says that voter manipulation increases the level of voter tolerance for welfare reduction. It raises their thresholds levels so that voters become more patient and reduce their propensity to punish. One may interpret this as voter intimidation, vote buying or vote rigging. This effectively reduces the probability of voting for the opponent at all levels of price distortions by subverting the ability of citizens to express their preferences over policy.

$$\Pr([w(0) - w(d)] < \frac{X_i}{[1 - \lambda(c)]}) = 1 - F([1 - \lambda(c)]x(d)) \tag{3.2}$$

The distribution of voter thresholds levels, hence the shape of $F(x(\overline{p}))$ has a critical bearing on the winning formula. For example, when ethnicity has a large influence on voting patterns (i.e. the case of identity voting), the incumbent is able to distort more and win if he belongs to a large ethnic group. The framing of the voting rule also admits for ideology to play an important role whereby socialist societies will accept higher levels of distortions before they vote the incumbent out. In both these cases, electoral manipulation may not be necessary for the incumbent to set higher distortions.

While acknowledging the importance of these factors, the chapter focuses on the effect of absence of electoral accountability. It concentrates on the possibility that desired rents require electoral manipulation. The winning strategy now involves devoting some resources

towards electoral manipulation. Such a process may involve paying-off the military, police and some militia to intimidate voters as witnessed in Zimbabwe in the past decade (Bracking 2005). In other countries, this may involve outright buying of voters. While in others, incumbents hand pick the electoral commission and give them huge perks to sway the results in the incumbents' favor.

Incumbent's maximization problem

In period t, the incumbent's objective is to maximize his indirect utility function, V_t, taking into consideration the behavior of voters. Assume that once booted out of office, the incumbent does not earn any new income. The incumbent's maximization problem is thus given by (3.3) where ω_t is the official reward of being in office, $r(d_t)$ are rents from distortions in the current period, β is a discount factor and $E(V_{t+1})$ is the expected indirect utility of being in office in the next term. We thus have an electoral accountability model similar to Ferejohn (1986) and Persson & Tabellini (2000). Unlike these models, incumbents can manipulate the electoral process and voters do not need to coordinate.

$$\max_{d_t^*, c_t^*} \{V_t = \omega_t + r(d_t) + \beta[1 - F([1 - \lambda(c_t)]x(d_t))]E(V_{t+1})\} \tag{3.3}$$

The next period's expected rents from office, hence $E(V_{t+1})$ can be a function of choices d_t and c_t in principle. While this is generaly true, I shall assume that d_t and c_t affect future rents only through their effect on the probability of reelection in order to simplify the analysis. The incumbent's maximization problem is to choose d_t and c_t that maximizes his utility. There is a trade-off involved. Raising d_t increases rents but reduces expected future rents due to a decline in the probability of re-election. The incumbent has to mitigate against the declining popularity by spending c_t on electoral manipulation.

3.3.2 Characterizing the equilibrium distortion

The first order conditions for the maximization problem presented in (3.3) with respect to d_t and c_t are given by expressions (3.4) and (3.5) respectively, where $f(\cdot)$ is the probability density function of X_i.

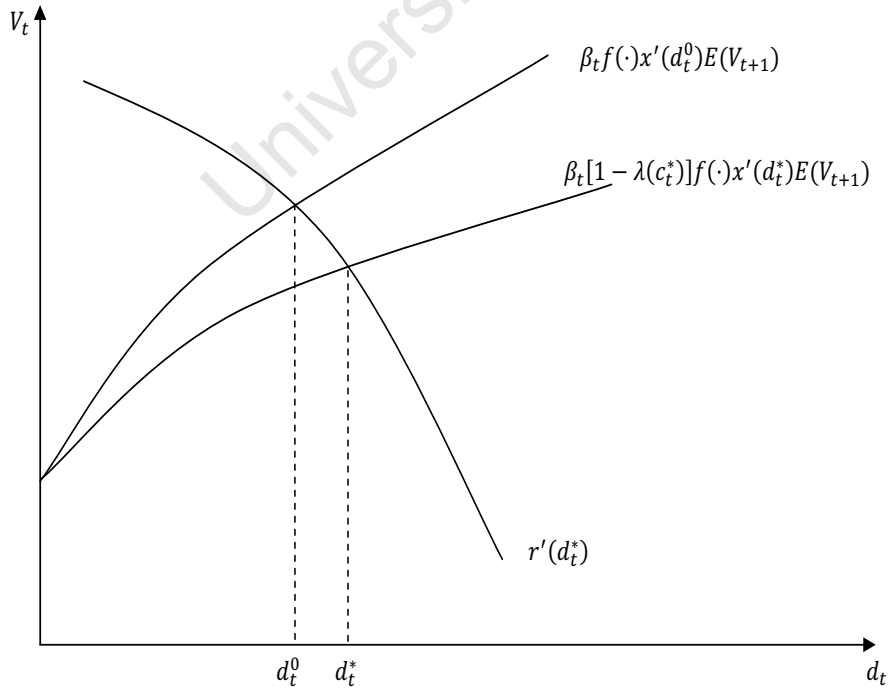
$$\frac{dV_t}{\partial d_t^*} = r'(d_t^*) - \beta_t[1 - \lambda(c_t^*)]f(\cdot)x'(d_t^*)E(V_{t+1}) = 0 \tag{3.4}$$

$$\frac{dV_t}{\partial c_t^*} = -1 + \beta_t \lambda'(c_t^*) f(\cdot) x(d_t^*) E(V_{t+1}) = 0 \tag{3.5}$$

The first order condition in (3.4) implies that the incumbent distorts up to point where the marginal increase in rents equals to the marginal loss in expected future rents. Note that $\lambda(c_t) = 0 \; \forall c$ when electoral manipulation is not possible. In this case, (3.4) reduces to (3.6). A comparison of expressions (3.4) and (3.6) shows that the marginal loss in expected future rents caused by increasing distortions in the current term is $[1 - \lambda(c_t)]$ times lower when electoral manipulation is possible than when it is not possible, yet the marginal benefit is the same. As illustrated in figure 3.1, this implies that equilibrium distortions will be higher when electoral manipulation is possible (i.e. whenever $\lambda(c_t) > 0$ for $c_t > 0$). Figure 3.1 illustrates that d_t^0, the equilibrium distortions that corresponds to higher marginal losses in expected future rents in the absence of electoral manipulation, is lower than d_t^*, the equilibrium distortion when the marginal expected loss in future rents is lowered by electoral manipulation.

$$\frac{dV_t}{\partial d_t^0} = r'(d_t^0) - \beta_t f(\cdot) x'(d_t^0) E(V_{t+1}) = 0 \tag{3.6}$$

Figure 3.1. Comparison of the equilibrium distortions with and without electoral manipulation



The higher the expenditure on electoral manipulation, hence the closer $\lambda(c_t^*)$ is to 1, the lower is the marginal loss in expected future rents. Therefore an incumbent is able to raise distortions by investing in electoral manipulation. However spending on electoral manipulation is a cost that has to be balanced against the increase in future expected rents benefits it brings. This trade off is shown in (3.5), the FOC with respect to expenditure on electoral manipulation.

Expression (3.5) implies that an incumbent spends on electoral manipulation up to a point where the marginal increase in expected future rents due to an additional unit of money spend on electoral manipulation $[\beta_t \lambda'(c_t^*) f(\cdot) x(d_t^*) E(V_{t+1})]$, equals the marginal cost (which is equal to 1). It also implies that the incumbent will find it optimal to manipulate the electoral process whenever $\lambda'(c) > 0$ for some $c > 0$. The equilibrium distortions will also be higher by implication.

This result implies that when institutions are weak, the incumbent always chooses higher distortions and then circumvents the electoral process. Thus excessive distortions are explained by institutional weakness that erode electoral accountability hence an absence of a mechanism to control moral hazard by self enriching politicians once they are in office. The model outlined above thus offers a plausible explanation of the existence high distortions, with overwhelming adverse effects on the majority of the population, that are witnessed in some developing countries.

3.4 Application to exchange rate overvaluation in Sub–Saharan Africa

The result from the theoretical model outlined above showed that incumbent governments in countries with weak institutions are able and will distort more for the purposes of rent seeking. This implies the following testable hypothesis in applied research: ***Less democratic countries have higher distortions***.

This thesis tests this hypothesis on the exchange rate policy in Sub–Saharan Africa for the period 1980 – 1998. Most countries in Sub–Saharan Africa have poor political institutions and have tended to over value the exchange rate –sometimes excessively. The extent of over-valuation is reflected in the parallel market premium. The parallel market premium was in excess of 100% about 30% of the time during this period. There are 12 episodes of persistence of large premiums for 4 or more consecutive years between 1980 - 1998. The

persistence is longer in some countries and shorter in others, while some other countries never had excessive premiums at all. There is variation in both the magnitude and persistence of exchange rate distortions. Democratic institutions have suffered different fates over the same period as well. This motivates an assessment of whether differences in the quality of democratic institutions influenced variations in exchange rate overvaluation as hypothesized above.

An overvalued exchange rate generates rent seeking opportunities for those with access to cheap foreign currency. These are mostly people in positions of influence. The foreign currency can either be disposed off on the parallel market at a premium or used to import luxury commodities at a low cost. The premium is higher and the cost of importing lower when the exchange rate is highly overvalued. However, the cost of excessive over-valuation is usually great. It harms the export sector, lowers returns to investment and increases structural bottlenecks that consequently reduce output and employment. This generates political pressure. One expects the incumbent to maintain low exchange rate distortions or restrict persistence of excessive distortions unless he has other means to mitigate this pressure.

3.4.1 Empirical estimation

Define *lxrate* as log of the parallel market rate to the official exchange rate ratio and *polity2* as a measure of political regime characteristics hence the quality of electoral institutions. To test the first hypothesis one estimates the following econometric model

$$lxrate_{it} = \gamma Polity2_{it} + \beta x_{it} + \mu_i + \epsilon_{it} \tag{3.7}$$

where country and year are denoted by subscripts i and t respectively, x_{it} is a vector of controls including the constant, μ_i are unobserved country specific effects and ϵ_{it} is a random disturbance which varies with time and country. Given the macro nature of the data, it is more appropriate to estimate the dynamic model in (3.8) where γ_1 is expected to be negative. Furthermore, a dynamic model is theoretically appealing is one assumes that future rents are endogenous to the choice of current period distortions.

$$lxrate_{it} = \delta lxrate_{it-1} + \gamma_1 Polity2_{it} + \beta x_{it} + \mu_i + \epsilon_{it} \tag{3.8}$$

Estimating (3.8) poses some problems. Firstly, $lxrate_{it-1}$ is correlated with μ_i, hence the

OLS estimator is biased and inconsistent. Similarly, the random effects estimator is also biased and inconsistent. By construction $lxrate_{it-1} - \overline{lxrate_i}$ is correlated with $\epsilon_{it} - \overline{\epsilon_i}$ even if the disturbances are not serially correlated since $\overline{\epsilon_i}$ contains ϵ_{it-1}. Therefore, the within fixed effects estimator is also biased (see Nickell 1981). The fixed effects estimator however becomes consistent as $T \to \infty$. The alternative is to apply a first difference transformation on (3.8) to wipe out the fixed effects and then use IV estimation with $lxrate_{it-2}$ as an instrument for $\Delta lxrate_{it-1}$ (see Anderson & Hsiao 1981, Arellano 1989). Although this produces consistent estimates, they are not necessarily efficient.

Various alternatives have been proposed to improve the precision of these estimates. All of them are GMM based procedures that utilize additional moment restrictions to estimate the parameters in (3.8). Let $y_{it} = lxrate_{it}$, and $w_{it} = (polity2, x_{it})$, $\theta = (\gamma_1 \ \beta)'$, then (3.8) can be rewritten as (3.9), with the following assumptions i) $E(\mu_i) = E(\epsilon_{it}) = E(\mu_i \epsilon_{it}) = 0$, ii) errors are serially uncorrelated (i.e. $E(\epsilon_{is}\epsilon_{it}) = 0$ for $s \neq t$) and iii) predetermined initial conditions (i.e. $E(y_{i1}\epsilon_{it}) = 0$ for $t = 2, ..., T$).

$$y_{it} = \delta y_{it-1} + w_{it}\theta + \mu_i + \epsilon_{it} \tag{3.9}$$

Also applicable to this analysis is the assumption of presence of fixed effects (i.e. $E(w_{it}\mu_i) \neq 0$). An additional assumption is that either w_{it} are strictly exogenous (i.e. $E(w_{is}\epsilon_{it}) = 0$ $\forall t, s$), predetermined (i.e. $E(w_{is}\epsilon_{it}) = 0$ for $s \leq t$), endogenous (i.e. $E(w_{is}\epsilon_{it}) = 0$ for $s < t$) or that a subset, w_{it}^e, of w_{it} is endogenous. For expositional purposes, assume that w_{it} is predetermined.

The above assumptions imply that both w_{it} and y_{it-1}, are correlated with μ_i. To eliminate the unobserved individual effects, (3.9) is first differenced to give (3.10)

$$\Delta y_{it} = \delta \Delta y_{it-1} + \Delta w_{it}\theta + \Delta \epsilon_{it} \tag{3.10}$$

The assumption of predetermined initial conditions implies the moment conditions $E(y_{i,t-s}\Delta\epsilon_{it}) = 0$ for $t = 3, ...T$ and $s \geq 2$ while that of predetermined w_{it} imply $E(w_{i,t-s}\Delta\epsilon_{it}) = 0$ for $t = 2, ...T$ and $s \geq 1$. This gives a complete set of linear moment conditions for (3.10)

that can be expressed as $E(Z_i^{'}\Delta\epsilon_i) = 0$ where

$$Z_i = \begin{pmatrix} y_{i1} & w_{i1} & w_{i2} & 0 & 0 & 0 & 0 & 0 & ... & 0 & ... & 0 & 0 & ... & 0 \\ 0 & 0 & 0 & y_{i1} & y_{i2} & w_{i1} & w_{i2} & w_{i3} & ... & 0 & ... & 0 & 0 & ... & 0 \\ . & . & . & . & . & . & . & . & ... & . & & . & . & & . \\ . & . & . & . & . & . & . & . & ... & . & & . & . & & . \\ . & . & . & . & . & . & . & . & ... & . & & . & . & & . \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & ... & y_{i1} & ... & y_{i,T-2} & w_{i1} & ... & w_{i,T-1} \end{pmatrix}$$

If instead an endogenous w_{it} is assumed, that would imply $E(w_{i,t-s}\Delta\epsilon_{it}) = 0$ for $t = 3, ...T$ and $s \geq 2$ hence the matrix Z_i will be adjusted accordingly by deleting the columns with the $w_{i,t-1}$ as the last non-zero element. A similar principle applies if only a subset w_{it}^e of w_{it} is endogenous while another set w_{it}^p is predetermined. In this case $E(w_{i,t-s}^e\Delta\epsilon_{it}) = 0$ for $t = 3, ...T$ and $s \geq 2$ while $E(w_{i,t-s}^p\Delta\epsilon_{it}) = 0$ for $t = 2, ...T$ and $s \geq 1$. Expressing $w_{it} = \{w_{it}^p \; w_{it}^e \}$, then Z_i above will be adjusted accordingly by deleting only columns with $w_{i,t-1}^e$ as the last non zero element.

Let $\alpha = (\; \delta \quad \theta \;)^{'}$and $X_{it} = (y_{i,t-1},\, w_{it})$, then the sample analogue for the moment conditions $E(Z_i^{'}\Delta\epsilon_i) = 0$ is $b(\alpha) = \frac{1}{N}\sum_{i=1}^{N} Z_i^{'}\Delta\epsilon_i(\alpha) = 0$. The GMM estimator for (3.10) is thus given by (3.11) for some positive definite weighting matrix W_N.

$$\begin{aligned} \widehat{\alpha}_{GMM} &= \arg\min \left(\frac{1}{N}\sum_{i=1}^{N} Z_i^{'}\Delta\epsilon_i(\alpha)\right) W_N \left(\frac{1}{N}\sum_{i=1}^{N} Z_i^{'}\Delta\epsilon_i(\alpha)\right) \\ &= (\Delta X^{'} Z W_N Z^{'}\Delta X)^{-1}\Delta X^{'} Z W_N Z^{'}\Delta \mathbf{y} \end{aligned} \tag{3.11}$$

Different choices of W_N produce alternative GMM estimators. The Arellano-Bond one step estimator uses $W_N = (N^{-1}\sum_{i=1}^{N} Z_i^{'} H Z_i)^{-1}$ where H is a $T-2$ square matrix with twos in the main diagonal, minus ones in the subdiagonals and zeros elsewhere. The two step GMM estimator uses $W_N = (N^{-1}\sum_{i=1}^{N} Z_i^{'}\Delta\widehat{\epsilon}_i\Delta\widehat{\epsilon}_i^{'} Z_i)^{-1}$ where $\widehat{\epsilon}_i$ is a consistent estimate of ϵ_i obtained in a first step estimation.

The two step estimator is asymptotically more efficient than the one step estimator since it uses an optimal weighting matrix. However the asymptotic variance of the two step estimator maybe unreliable in finite samples because it neglects the variation introduced by the use of $\widehat{\alpha}$ in the construction of the optimal weight matrix. In fact, Blundell & Bond

(1998) observe from Monte Carlo simulations that t-tests based on the one-step estimator have the correct empirical level while those based on the two step estimator tend to over reject, *especially when errors are non-normal or heteroskedastic*. Also, Monte Carlo simulations by Judson & Owen (1999) indicate that the one-step estimator out performs the two step estimator. Given these observations and following recommendations from Judson & Owen, the one-step GMM estimator shall be used here[2].

Other issues arise with the above estimators. Firstly, the above procedure is valid only if there is no second order serial correlation. This can be tested using the Arellano-Bond test for second order serial correlation in the first differences. Secondly, the number of instruments grows rapidly with T if all available lagged instruments are used. Therefore, there is a danger of over fitting when T is moderately large relative to N. One should test for over identification. A Sargan test for over identification is utilized for this purpose. This test is reliable for the two step GMM. However, it has a "strong tendency to over reject in the presence of heteroskedasticity" in the one step estimator and no robust χ^2 Sargan test based on the one step GMM is available (Arellano & Bond 1991)[pp 282].

Conditional logit model

Polity2 increases as democratization increases. One expects γ to be negative and significant. However, such an effect may be a reflection of other factors. For example, it might be the case that countries with poor institutions have poor policy makers. In this case, even though rent seeking might not be the objective of exchange rate over-valuation, distortions can still be observed for other reasons. Thus a negative γ is also consistent with a benevolent politician who is not gifted with excellent policy making skills in countries with poor institutions.

The conditional or fixed effects logit can be used to identify the impact of institutions on the magnitude of markets distortions. Define ϖ a threshold level of the parallel market rate to the official exchange rate ratio. Once the ratio is above ϖ the distortion is deemed excessive. Thus a dichotomous variable can be used to represent the extent of distortions. Call the variable *noexcess* and let it take a value of 1 when the ratio is below ϖ and 0 otherwise. For country i in period t, denote *noexcess* by y_{it}. The fixed effects logit

[2]A more efficient estimator, especially as the autoregressive parameter approaches unity, is the systems GMM (SYS-GMM). This imposes an additional initial condition restriction that $E(\Delta y_{i2}\mu_i) = 0$. The SYS-GMM estimator is consistent and efficient if this restriction holds but inconsistent when the restriction is invalid. The restriction holds automatically if the same process has generated the data long enough but is unreasonable if the 1st observation corresponds to the true start up point as the case with some countries (like Zimbabwe) in the sample used in this study.

estimates the conditional likelihood function in (3.12)

$$L = \prod_{i=1}^{N} \Pr(y_{i1}, y_{i2}, ...y_{iT} | \sum_{t=1}^{T} y_{it}) \tag{3.12}$$

To see how this pins down the effects of institutions on the magnitude of distortions, consider the following example (adapted from Baltagi 2008) for a simple case of two countries and two periods. For the entire period, a country either has excessive distortions in both years (hence $y_{i1}+y_{i2}=0$), has no excessive distortions in both years (i.e. $y_{i1}+y_{i2}=2$) or has excessive distortions in only one of the 2 years (i.e. $y_{i1}+y_{i2}=1$). The first two cases do not add anything to the conditional log-likelihood since $\Pr(y_{i1}, y_{i2}|y_{i1}+y_{i2})=1$. Therefore the only observations that matter are given by

$$\Pr(y_{i1}=0, y_{i2}=1|y_{i1}+y_{i2}=1) \text{ and } \Pr(y_{i1}=1, y_{i2}=0|y_{i1}+y_{i2}=1)$$

Only observations from which a country switched either from a policy of excessive distortions to exchange rate alignment (i.e. $y_{i1}=0, y_{i2}=1$) or from a policy of exchange rate alignment to excessive distortions (i.e. $y_{i1}=1, y_{i2}=0$) do matter. Thus identification of the impact of institutions comes from countries that switched from an overvalued exchange rate to an appropriately valued exchange rate or vice versa. Therefore the fixed effects logit can be used to estimate the impact of institutions on the probability that a country has an aligned exchange rate. From the hypothesis outline above, one expects that stronger institutions increase the probability of a country having an aligned exchange rate. The coefficient of polity2 is expected to be positive and significant in the fixed effects logit model.

3.4.2 Data

The above hypothesis is tested using data from Sub-Saharan African countries outside the CFA. This analysis excludes the CFA countries because exchange rate manipulation is not an available instrument at a country level in the monetary union. The sample covers all countries for which data on the exchange rate premium and indicators of political regime characteristics are consistently available. The magnitude of the exchange rate distortions is measured by the ratio of the parallel market rate to the official exchange rate. This data is obtained from the African Development Indicators. It is consistently available up

to 1998.

Summary statistics for this variable are presented in table 3.1. The country mean parallel to official exchange rate ranges from 1.04 for Mauritius to 349 billion for DR Congo. Clearly countries like Angola and DR Congo are outliers which will have a big influence

Table 3.1. Summary statistics of political regime characteristics and exchange rate valuation from 1978 to 1998

Country	obs	min polity2	max polity2	mean premium[a]	max premium[a]	frequency of excess[b]
Angola	14	-7	0	2.49×10^{10}	6.67×10^{10}	14
Botswana	21	7	9	1.17	1.69	0
Burundi	21	-7	0	1.31	1.62	0
DR Congo	21	-9	0	3.49×10^{11}	1.0×10^{12}	21
Ethiopia	20	-8	1	2.08	3.39	8
Gambia	21	-7	8	1.07	1.34	0
Ghana	21	-7	6	3.499	22.44	9
Guinea	21	-9	-1	2.84	12.77	8
Kenya	21	-7	-2	1.15	1.58	0
Lesotho	16	-7	8	1.063	1.18	0
Liberia	7	-7	0	32.04	48.5	5
Madagascar	21	-6	9	1.23	2.05	2
Malawi	21	-9	6	1.39	2.23	1
Mauritania	19	-7	-6	1.82	2.69	9
Mauritius	14	9	10	1.04	1.09	0
Mozambique	19	-8	6	8.66	48.23	10
Namibia	2	6	6	1.05	1.06	0
Nigeria	21	-7	7	2.39	4.25	10
Rwanda	21	-7	-6	1.48	2.06	3
Sierra Leone	21	-7	4	1.69	4.05	4
Somalia	12	-7	0	1.58	2.66	2
South Africa	19	4	9	1.07	1.18	0
Sudan	21	-7	7	23.53	151.39	15
Swaziland	14	-10	-9	1.10	1.19	0
Tanzania	21	-7	-1	2.26	4.92	11
Uganda	21	-7	3	215.28	1020.63	12
Zambia	21	-9	6	1.97	7.80	6
Zimbabwe	21	-6	4	1.92	8.23	5

Source: Polity IV data and African Development Indicators
a- Ratio of the black market exchange rate to official exchange rate
b- Excessive overvaluation using a premium of 100% as the threshold

in the regression results and introduce heteroscedasticity. To avoid this, the exchange rate ratio is *winsorized* with the 90th percentile as the cut-off point. Thus, all values above 43.2 (the 90th percentile) are replaced by the value 43.2. This ratio is then converted into natural logarithms.

The definition of institutions is taken in the context of North's (1990) view of institutions as "the rules of the game in a society" and March & Oslen's (2005) definition of institutions as "constitutive rules and practices prescribing behavior for specific actors in specific situations". Thus we consider both *de jure* and *de facto* institutions. In that context, poor political institutions as applied in this study, refers to the absence or ineffective *de jure* framework and procedures for all citizens to participate and express their preferences over leaders and policies. It also refers to a *de facto* lack of guarantee of civil liberties in acts of political participation or expression of their political preferences. It also includes lack of or weak constraints on the exercise of power by the executive.

This concept is captured in the Polity IV data on political regime characteristics. Therefore, empirical estimation utilizes the polity2 score as a proxy of electoral accountability. Polity2 score is a combination of two indicators, *Democ* and *Autoc*. *Democ* is an indicator of institutionalization of democracy and *Autoc* is an indicator of institutionalization of autocracy. Both indicators range from 0 to 10. Both are an aggregation of indicators capturing the concepts of competitiveness of participation, competitiveness and openness of executive recruitment and constraints on the executive. The autocracy indicator also captures an additional concept of regulation in participation.

Opposite ranges are used for assessing the same concepts when constructing the democracy and autocracy indicators, giving a score of zero if the range is not applicable. For example, the concept of constraints on the executive is assessed on a range starting from whether there are substantial limits on the executive to executive parity or subordination. For the autocracy indicator, the assessment of the same category ranges from whether the executive has slight/moderate limitation to unlimited authority. Assessment of competitiveness of political participation for the democracy indicator ranges from factional to competitive while it ranges from suppressed to repressed in the autocracy indicator. Thus the democracy and autocracy indicators capture two opposite ends of the political regime spectrum[3].

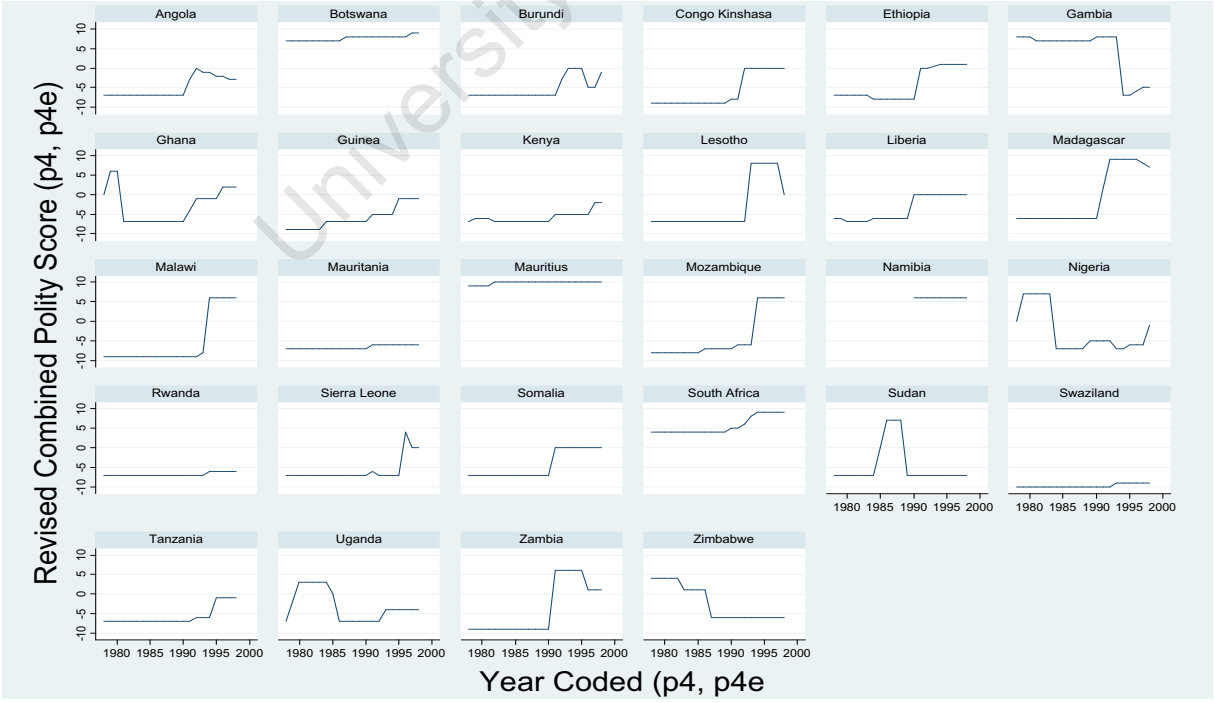
Polity2 is derived from subtracting *Autoc* from *Democ* and corrects for transitional periods. Thus polity2 ranges from -10 (indicating institutionalized autocracy) to 10 (indicating

[3]The reader is referred to the polity IV code book for a more detailed explanation (see *Polity IV Project: Dataset Users' Manual* 2007)

institutionalized democracy). For the period under analysis, the polity2 score has a minimum of -10 corresponding to the case of Swaziland and a maximum of 10 corresponding to Mauritius. The overall mode of polity2 is -7. This is also shown in table 3.1. The trends in different countries are presented in figure 3.2. The trends show a general improvement in regime characteristics in Sub-Saharan Africa. Nevertheless, there are several cases (e.g. Gambia, Sudan and Zimbabwe) where the regime characteristics changed for worse during the period under consideration. Botswana and Mauritius are the only countries which consistently had democratic regimes during the period 1978 - 1998.

There are other variables that may be correlated with polity2 that also influence the exchange rate. For example, political regimes characteristics may be correlated with aid inflows which also affects the exchange rate premium. The regressions controls for this and other variables to avoid the omitted variable bias and isolate the pure effect of political regime characteristics. These controls include foreign direct investment flows (FDI) as a percentage of GDP, openness as measured but the trade to GDP ratio, ODA aid flows as a ratio of GDP and log of GDP per capita in 2005 constant PPP. These variables are obtained from World Bank Development Indicators. Terms of trade for goods and

Figure 3.2. Trends in the Polity2 Index in selected Sub-Sahara African countries from 1978 to 1998



services with 1995 as a base year are also controlled for. Data of the terms of trade is obtained from Global Development Finance and World Bank Development Indicators. Two dummies, transition88 and transition77, are included to capture instances of standardized authority scores which are corrected for in the polity2 score. These dummies take a value of 1 during periods of transition and "interregnum" or anarchy respectively, and a value of zero elsewhere.

3.4.3 Results

From the theoretical framework, the expenditure on electoral manipulation by an incumbent depends on the quality of institutions. The incumbent decides to set high distortions and then manipulates the election when institutions are weak. Polity2 is outcome based hence the expenditure on electoral manipulation affects the *measured* polity2 score. Thus polity2 could be endogenous. FDI inflows and GDP may also be endogenous. Therefore, the estimation is based on the assumption that a subset of the explanatory variables is endogenous (i.e. we have $w_{it}^{e} = \{Polity2\ FDI\ GDP/capita\}$).

Table 3.2 presents the results from the dynamic panel data estimation. The GMM results correspond to the Arellano-Bond one estimator for reasons stated earlier. Bates (2008) suggests that some African countries adopted anti-market policies because of their alliance to the Soviet Union during the cold war. Column 2 presents estimation results that include dummies for the cold war period and the debt crisis. These dummies turn out to be insignificant. Column 3 results are for GMM with year dummies (the year dummies are not presented in the table) while column 4 has a binary measure for political regimes characteristics instead of polity2. The Anderson-Hsiao (AH) estimators are presented in columns 5 and 6. Robust standard errors are reported in all cases.

Results from the GMM estimation show that democratization induces a reduction in the parallel market rate exchange rate premium. Note that all variables including the dependent variable and polity2, are differenced in the GMM estimation procedure. Therefore coefficients measure changes in a change. The easiest way of interpreting the polity2 coefficient is in the context of changes in a polity with a durability of two or more years (i.e. $\Delta polity_{t-1} = 0$ so that $\Delta polity_t - \Delta polity_{t-1} = \Delta polity_t$). In this case, the coefficient of polity2 can be interpreted as a percentage point change due to a unit change from a *durable* polity. From the most conservative estimates in column 3, an improvement in the political regime measure by 1 unit leads to a reduction in the parallel market to official exchange rate ratio by 1.12 percentage points. This implies that a change from total dictatorship

Table 3.2. Dynamic panel estimation results

	Dependent variable: Lxrate					
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	dif-GMM	dif-GMM	dif-GMM	dif-GMM	AH1	AH2
$lxrate_{t-1}$	0.731***	0.729***	0.729***	0.735***	1.000***	0.976***
	(0.0485)	(0.0486)	(0.0494)	(0.0485)	(0.235)	(0.216)
$lxrate_{t-2}$	-0.124**	-0.124**	-0.110*	-0.160***		
	(0.0596)	(0.0595)	(0.0609)	(0.0608)		
$lxrate_{t-3}$	-0.133***	-0.145***	-0.148***	-0.119**		
	(0.0441)	(0.0444)	(0.0450)	(0.0464)		
Terms of trade	0.00210***	0.00193***	0.00203***	0.00135**	0.00521	0.00623**
	(0.000568)	(0.000573)	(0.000583)	(0.000562)	(0.00333)	(0.00316)
ODA aid	-0.554***	-0.517***	-0.548***	-0.456**	-0.114	-0.402
	(0.194)	(0.197)	(0.211)	(0.193)	(0.923)	(0.891)
Openness	-0.000450	-0.000206	0.000326	-0.000789	-0.00918	-0.0122*
	(0.00191)	(0.00188)	(0.00185)	(0.00169)	(0.00746)	(0.00714)
Transition88	0.119	0.140	0.126	0.176*	-0.412	-0.228
	(0.0977)	(0.0984)	(0.0998)	(0.0995)	(0.388)	(0.383)
Transition77	-0.00562	0.0253	0.0421	0.0873	-0.542	0.311
	(0.0952)	(0.0957)	(0.0959)	(0.103)	(0.446)	(0.471)
Polity2	-0.0133***	-0.0119***	-0.0112***		0.00137	
	(0.00405)	(0.00418)	(0.00423)		(0.0254)	
GDP per capita	-0.118	-0.0733	-0.112	-0.151	-0.0590	-0.664
	(0.132)	(0.126)	(0.126)	(0.109)	(0.967)	(0.912)
FDI	0.0116**	0.0118***	0.0128***	0.0120***	0.0522***	0.0480***
	(0.00451)	(0.00453)	(0.00453)	(0.00429)	(0.0189)	(0.0176)
Cold war		0.0567				
		(0.0389)				
Debt crisis		-0.00919				
		(0.0413)				
Democracy				-0.121***		0.408
				(0.0427)		(0.284)
Dem*xrate				-0.00456		-0.251***
				(0.00753)		(0.0730)
Observations	344	344	344	336	365	358
AR(2) test (p-value)	0.4724	0.4786	0.5466	.0.3862	-	-
Sargan test (p-value)	0.0020	0.0014	0.0014	0.0040	-	-

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

to a complete democracy in the next year will reduce exchange rate over valuation by at least 22.4 percentage points. Using estimates from columns 1, this change will be 26.6 percentage points.

In column 4, political regime characteristics are measured by a dummy (*democracy)* taking a value of 1 when polity2 is above the sample median (of -5). African states tended to be socialistic when they obtained their independence. A key feature was one party states. Thus they were more likely to be autocratic based on the polity2 scores. The categorization for the democracy dummy is based on the median polity2 score instead of 0, as the cut-off point. The significance of *democracy* confirms that more democratic countries are less likely to overvalue the exchange rate. However, *dem*xrate*, the interaction term between the exchange rate and democracy dummy is insignificant.

Availability of ODA aid reduces exchange rate over valuation, this simply indicates that high levels of AID assistance provides foreign currency reserves. This sustains foreign currency controls in a manner that inhibits the parallel market. Surprisingly better TOT and higher FDI inflows increase exchange rate over valuation. These effects are significant in all four GMM estimates.

The validity of using lagged variables as instruments hinges on the absence of second or higher order autocorrelation in the first differenced errors. The Arellano-Bond tests for absence of autocorrelation in first-differenced errors fail to reject the null hypothesis of no 2^{nd} or higher order autocorrelation. However, the Sargan test for over identification reject the validity of the restrictions in all cases. As highlighted earlier, the one-step Sargan tests is unreliable. The acceptance of the null of no second or higher order autocorrelation confirms the validity of lagged variable as instruments implying that GMM estimates in Table 3.2 are consitent. These estimates provide evidence that institutionalized democracies reduce exchange rate over valuation. This confirms the argument that weak electoral institutions permit the incumbent to maximize on the appropriation of rents. The same conclusion is reached from static fixed effects estimation results shown in table A.1 in appendix A.

The Anderson-Hsiao estimates presented in column 5 show total persistence in the exchange rate premium. All other variables, except the FDI are insignificant. When political regimes are proxied by a dummy, a significant impact on the exchange adjustment is found. This is shown by the significance of the interaction term in column 6. The coefficient of *dem*xrate* implies a downward adjustment of 25.1% of the exchange rate premium from its previous level in more democratic societies compared to autocratic countries. This implies that policy makers in democratic countries will more likely correct exchange rate

misalignments when compared to those in autocratic countries. This is the expectation when there is electoral accountability.

Evidence from the likelihood of having an aligned exchange rate further confirms the hypothesis that exchange rate distortions were higher in countries with very weak democratic institutions. If exchange rate overvaluation is purley attributable to benevolent reasons, then its negative impact and the resultant pressure should induce an exchange rate alignment irrespective of the quality of institutions. If this were the case, political regime characteristics will not have a significant effect on the probability of having an aligned exchange rate. This is tested using a fixed effects logit model. The dependent variable is Noexcess, based on a cut-off parallel to official rate ratio of 2 (i.e. a black market premium of 100%). *Noexcess* takes the value of 1 if the ratio is less than 2 and zero otherwise hence the probability of having an aligned exchange rate is estimated. This estimation excludes countries like Gambia which never overvalued excessively and countries like DRC which overvalued excessively all the time. The final estimation was carried out with 13 countries and 277 observations.

The fixed effects logit results are presented in table 3.3 column 1. Polity2 has a positive and significant coefficient. This confirms the hypothesis that more democratic regimes are more likely to have an aligned exchange rate. Alternatively expressed, less democratic regimes are more likely to have an overvalued exchange rate. Large exchange rate distortions create rents which benefits the incumbent even if the overvaluation is initially well-intentioned. Such corruption and the welfare losses it brings, will generate political pressure which is costly for incumbents in democratic societies who lack alternative means of mitigating the pressure. Incumbents in undemocratic countries are insulated from this pressure. They opt for suppression and keep both rents and power, while politicians in democratic societies will have to maintain minimal distortions if they are to maintain political power.

The choice of a 100% premium (i.e. cut-off point of 2) might seem arbitrary. Therefore, a fixed logit model was also estimated at a different cut-off point of 1.5 (i.e. 50% premium)[4]. As shown in column 2, the conclusion remains the same. More democratic societies are more likely to have an aligned exchange rate than autocratic regimes.

The results also show that recipients of higher AID and FDI inflows as well as those facing improvements in terms of trade are less likely to reduce the magnitude of distortions while countries with higher income per capita are more likely to adjust. The later could be

[4]Using a higher cut-off point severely reduces the number of observations since more countries will have $Noexcess = 1$ all the time. Also, there will be more consecutive observations taking a value of one. These will be dropped in the estimation resulting in the use of fewer observations

Table 3.3. Conditional logit results for the probability of having an aligned exchange rate

Variable	(1) Cut–off ratio of 2	(2) Cut–off ratio of 1.5
Polity2	0.255***	0.196***
	(0.0686)	(0.0544)
FDI	-0.330**	-0.0315
	(0.144)	(0.0669)
GDP per capita	5.446***	3.973***
	(1.634)	(1.412)
ODA aid	4.088*	5.605**
	(2.334)	(2.273)
TOT	-0.0246***	-0.0218***
	(0.00643)	(0.00581)
Openness	-0.0148	-0.0159
	(0.0265)	(0.0212)
Transition(88)	-2.592**	-1.654
	(1.174)	(1.207)
Transition(77)	-0.878	-2.086
	(1.219)	(1.519)
Observations	227	278
Number of countries	13	16
LR $\chi^2(8)$	47.64***	53.18***

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

attributed to the fact that suppression is more costly in higher income societies as argued above.

3.5 Discussion

Evidence from GMM and fixed effects logit estimation confirmed the hypothesis that less democratic countries have higher exchange rate distortions. These findings provide evidence for this thesis' alternative theory on the existence of high market distortions. Distortions that prevail in an economy are an outcome of the interaction between self enriching office bearer's rent seeking motives and the quality of institutions that determine electoral accountability. Office bearers have an incentive to raise market distortions and maximize rents that accrue to them, despite negative welfare effects caused by higher distortions. In democratic societies, citizens can fully express their preferences over policies through voting. Therefore, electoral accountability becomes an effective tool for control-

ling moral hazard by politicians while in office. This constraints the ability of the office bearer to raise distortions. The absence of electoral accountability in countries with weak institutions permits incumbents to maximize on rent seeking. There is no incentive for a self interested dictator to please the electorate because there are other effective means for mitigating electoral pressure. As a result distortions will be higher and last longer in undemocratic countries.

The case of Zimbabwe supports this argument. The government adopted an increasingly interventionist policy since 2000. These policies led to hyper-inflation, a sharp economic contraction (IMF 2005) and high unemployment. Yet they persisted. The distortions generated exclusive rents which accrued to party stalwarts and others in positions of influence. A key group that benefited includes high ranking officers in the military, intelligence and police services and traditional chiefs. This group and high ranking ruling party officials were recipients of free farm implements (Gwaze 2003), subsidized fuel and concessionary agriculture loans (*Financial Gazette, 23-29 October* 2003, ANDNetwork Journalist 2006), foreign currency at the official rate (Chikukwa 2004), prime land under the land reform programmes (Selby 2006) and many other benefits from distortions. Traditional chiefs began to receive salaries and cars in 2002. The benefits that accrued to people in certain position manifests the sharing of rents by the incumbent.

Events prior to the presidential elections in 2002 and 2008 showed that recipients of rents acted to mitigate political pressure. Security and uniformed personnel became an integral part of a "rule by fear and violence strategy" (Bracking 2005). The Political Order and Security Act which outlawed gatherings of 12 or more people without police approval came into effect in January 2002. Opposition parties failed to get this approval most of the time (Zimbabwe Human Rights NGO Forum 2002). The 2002 election was marred by violence against opposition supporters but perpetrators were not arrested. The incumbent won the election which was widely deemed not free and fair by independent observers. However, the Zimbabwe Electoral Commission (ZEC) which is hand picked by the incumbent approved the election. The election result was contested in court. The 6 year presidential term expired before the courts reached a decision. When the position of the incumbent came under electoral threat after the 2008 presidential first round election, the military and "militia" stepped in the election run off (Zimbabwe Human Rights NGO Forum 2008). The opposition candidate pulled out citing violence and intimidation.

The weakness of electoral institutions in Zimbabwe is evidenced by the failure of courts to settle electoral disputes as well as an electoral commission handpicked by the incumbent president. This made electoral manipulation an additional and attractive tool for mitigat-

ing pressure while the incumbent extracted rents from high distortions. These rents were shared with people integral in circumventing the electoral process. This allowed higher distortions to persist since 2000. For example, the black market premium had reached 24 000% in January 2008 (BBC 2008). If a person obtained foreign currency at the official rate, he could import a luxury vehicle at a local currency equivalent that was barely enough to buy 5 liters of cooking oil. Only high placed individuals had access to foreign currency at the official rate. Thus distortions generated rents that accrued to the incumbent and those he shared rents with. The persistence of such distortions was encouraged by the lack of electoral accountability due to weak democratic institutions.

3.6 Conclusion

The chapter argued and presented evidence on the interaction between office bearers' incentives and the quality of electoral institutions. When institutions are weak, self enriching office bearers maximize the appropriation of rents by maintaining higher distortions. Through electoral manipulation, they mitigate political pressure caused by welfare losses from high distortions. This allows them to continue the extraction of rents despite huge welfare losses such rents may bring. Therefore, the existence of high distortions is attributable to weak electoral institutions which erode electoral accountability. This permits the office bearers' financial motives for maximization of appropriation of rents to prevail. Empirical evidence from exchange rate overvaluation in Sub–Saharan Africa supports this argument. Less democratic less likely to maintain aligned exchange rates, they distort more instead.

Events in Zimbabwe since 2000 support this explanation. High distortions have existed since 2000. These distortions persisted despite their apparent failure to protect the poor and their perverse effects on the economy as a whole. The weakness of democratic institutions and the perceived manipulation of elections in Zimbabwe over the same period can not be overemphasized. Thus, distortions in Zimbabwe are a good example of distortions sustained to financially benefit the incumbent in a weak institutional environment. This makes Zimbabwe a useful case study for investigating the impact of rent generating distortions that persist over long periods due weak institutions. The next chapter uses the policy changes in Zimbabwe to investigate the social costs of these market distortions.

Chapter 4

The social evils of market distortions: An application to health outcomes in Zimbabwe

4.1 Introduction

Like most developing countries, Zimbabwe adopted structural adjustment programmes starting in 1991. Under these programmes, the domestic market was deregulated and market forces given a greater role. However, after the year 2000, there was a major policy shift towards greater market intervention. The resulting distortions led to asymmetric access to commodities and generated exclusive rents. In addition, distortions hastened an economic contraction that disproportionately affected ordinary citizens while rent seekers were cushioned. These factors shifted the distribution of resources, concentrating access to commodities among the wealthy few and leaving the poor with minimal resources (Reserve Bank of Zimbabwe 2006). This had far reaching consequences for outcomes that are intrinsically important to human life. However, little empirical analysis has focused on the consequences of the policy changes on social outcomes like health. For this reason, this chapter seeks to investigate the effects of the resulting market distortions on health inequality among children in Zimbabwe.

The focus on health outcomes is motivated by three major reasons. Firstly, health is a direct measure of well-being and functionings (Sahn & Younger 2005, Sahn & Stifel 2003).

Unlike income or expenditure, it adequately captures the notion of poverty as deprivation of capabilities or failure of certain functionings (Sen 1987). Secondly, health achievements largely influence people's ability to exercise most other freedoms and capabilities. Last but not least, health inequality is materially relevant in itself if it is caused by poor economic policy (Sen 2002), as with the case of market distortions.

The policy shift in Zimbabwe offers a good example of policies that are sustained to enrich policy makers despite their negative consequences. The effects of such policies on well-being are yet to be fully explored. I argue that policy changes generated rents that benefited only a few by design. This shifted command over resources and placed them in the hands of a few people in positions of influence. The majority were left with minimal resources. This reduced access to food and consequently worsened health outcomes on average (Moursi et al. 2008, Steyn et al. 2006). The poorest were the most affected since a majority of beneficiaries from rents are the elite. Thus policy changes increased wealth and consumption inequality. This ultimately increases health inequality. This argument is consistent with a neo-materialism interpretation of health differences which attributes differences in individual health outcomes to differences in individual resources, among them food availability (Lynch et al. 2000).

Using the 1999 and 2005/06 DHS data, the chapter asseses the above argument. The data respectively covers the period before and after the policy shift. Only children aged 5 years or less are included in this analysis. Thus only children born after the policy change are included in the 2005/06 sample. This facilitates a distinct comparison of child outcomes before and after the policy shift. The objective of the chapter is to empirically establish that market distortions reduced food consumption on average and increased its inequality. Reduced food consumption worsened health outcomes and the increase in food consumption inequality had a significant negative impact on health inequality among children. Food consumption is measured by a food variety score. Child health outcomes considered are stunting and underweight. The inequalities in food consumption and health are estimated using the Kakwani et al. (1997) concentration index based on rankings on an asset index derived from principal component analysis. The change in wealth inequality is estimated from the asset index using a measure of relative inequality proposed by McKenzie (2005).

Empirical results show that outcomes worsened after the policy shift. The average number of food items consumed by children declined by 34%. The decline occurred across all wealth quartiles. It was greater for children living in households in the poorest and middle wealth quartiles and least for children in the richest quartile. Both means of height for age and

weight for age declined significantly. Mean height for age declined by 19%. Its decline was greatest in the middle quartiles. Mean weight for age declined by 16%. Its decline was highest among the poorest and second poorest asset quartiles. The coefficient of the food variety score is positive and significant for both height and weight for age in 1999 and 2005/06. Its magnitude implies the decline in mean food consumption reduced means of height and weight for age by 37% and 59% of their overall changes. The decline in food consumption under the new policies significantly worsened health outcomes among children in Zimbabwe.

The McKenzie measure of inequality indicates that wealth inequality in 2005/06 was 16% higher than in 1999. Estimates of the Kakwani et al. (1997) concentration index for food consumption show increasing consumption inequality. This is evidenced by a 48% increase in the concentration index. A decomposition that quantifies the impact of increased inequality in food consumption on the change in health inequality shows that it contributed to an increase in stunting and underweight inequality by 11.3% and 6.5% respectively. Since the change in consumption inequality is attributed to market distortions, this implies distortions adversely affected the distribution of health among children.

The rest of the chapter is organized as follows: Section 4.2 provides an overview of policy changes towards greater government intervention in Zimbabwe since the year 2000. Section 4.3 introduces the data, discusses measurement issues and presents findings on changes in the means and inequalities in wealth, food consumption and health outcomes. Section 4.4 analyzes the determinants of child health outcomes and decomposes the sources of changes in health inequality to isolate the impact of a change in food consumption inequality. Section 4.5 explains why the outcomes are attributable to the effects of market distortions that prevailed post 1999. An overall discussion of findings is made in section 4.6 and section 4.7 concludes the chapter.

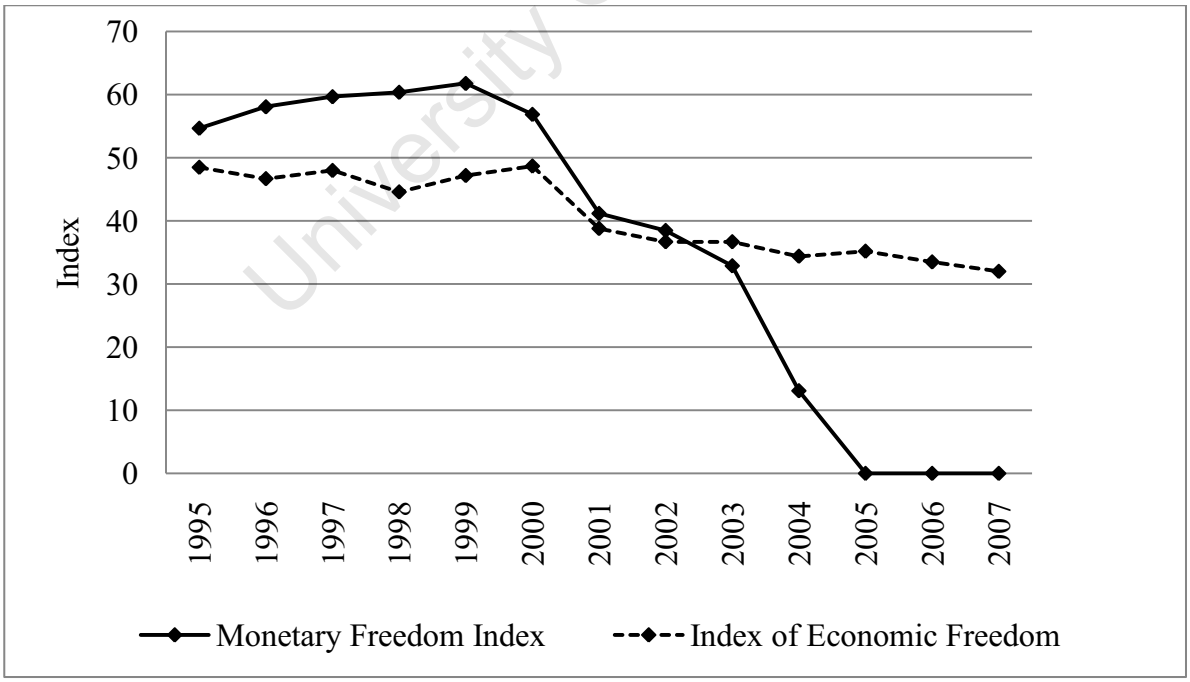
4.2 Policy changes and market distortions in Zimbabwe since 2000

Since 2000, there has been a major policy shift in Zimbabwe. This started with the chaotic implementation of the land reform program which triggered an economic collapse (Richardson 2007). Inflation rose sharply as the economy contracted. For example, month on month inflation in September 2001 was 15.9% compared to 3.9% in September 1999. Government imposed price controls on basic commodities through Statutory Instrument

No.334 of 2001 as a response to the sharp increase in inflation. Prices of basic commodities in October 2001 were pegged at their August levels through this Statutory Instrument. The list of controlled commodities was enlarged in November 2002 to include at least 70% of the items included in the consumer price index basket (IMF 2003). This was a big shift from the 1990s when the domestic market was largely deregulated.

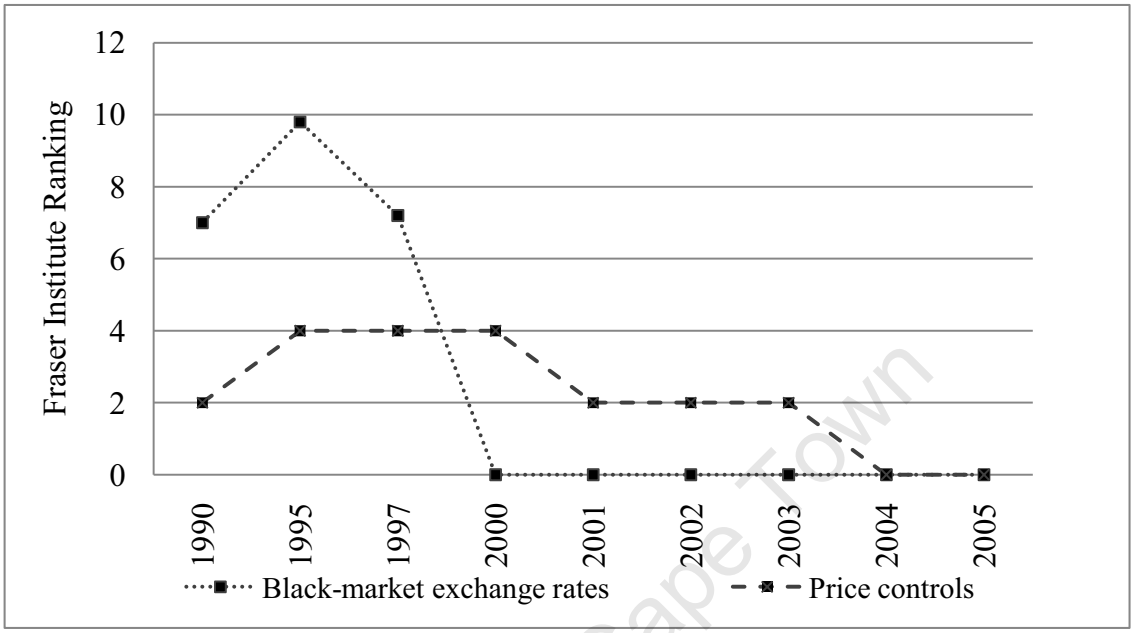
Controls were not limited to consumer products, but extended to other key markets like the foreign currency market, interest rates and fuel. In fact, the whole economy became increasingly controlled in comparison to the pre 1999 period. This is shown in figures 4.1 and 4.2. Shown in figure 4.1 are trends of the Heritage Foundation index of economic freedom and the monetary freedom index, one of its sub-components. The Heritage Foundation indices range from 0, indicating total government intervention, to 100, representing complete economic freedom. The trends for Zimbabwe show a continued decline in economic freedom for both the overall index and its subcomponents starting in 2000. The monetary freedom index, which takes price controls into account, reached the lowest possible value in 2005 following an even steeper decline after 2003.

Figure 4.1. Trends in indices of economic freedom and monetary freedom for Zimbabwe: 1995 to 2007



Source: Heritage Foundation 2009

Figure 4.2. Trends in the Fraser Institute rankings on price controls and black market exchange rates for Zimbabwe: 1990 to 2005



Source: Fraser Institute, 2008

Consistent with trends of the Heritage Foundation indices, the Fraser Institute ranking on price controls, shown in figure 4.2, started to decline from 2000 and reached a ranking of 0 in 2004. The rankings range from 0 to 10 with a rank of 10 indicating a complete absence of the distortion. The rankings for price controls indicate an increasingly controlled economy beginning with a 50% drop in 2001 and reaching the lowest possible ranking of 0 in 2005. The ranking for black market exchange rates was 0 in 2000 compared to a ranking of 7 in 1997. Foreign currency distortions were indeed severe. Between 2000 and 2005, the ratio of the parallel to official exchange rate ratio reached its peak in the last quarter of 2003 when the parallel market rate went 650% above the official exchange rate (IMF 2005). This divergence of the parallel market rate halted briefly at the introduction of the auction system in 2004. It later continued until the dollarization of the economy in 2009. By that time, the ratio of the parallel to the official rate had risen to above 10 million.

Other distortions were in the form of concessionary and negative real interest rates and a two tier fuel pricing system. There were huge interest rate distortions under the Pro-

ductive Sector Finance Facility (PSFF) which provided loans to the productive sector at concessionary interest rates. In January 2004 for example, the concessionary rate was 30% per annum at a time when the average commercial lending rate was 500%, year on year inflation 622.8% and interest on call accounts as high as 450% (Reserve Bank of Zimbabwe 2004b). In 2003, a two tier fuel pricing system was established. Farmers, passenger transport operators and government departments would pay subsidized prices while the rest of the economy faced market prices charged by private oil companies.

This was in contrast to the policy regimes in the 1990s under the implementation of structural adjustment programs, ESAP and ZIMPREST. These policies sought to liberalize the economy to give market forces a greater role. Under ESAP, most price controls on basic commodities had been removed. This is evidenced by the upgrade in the Fraser rankings for price controls from 2 in 1990 to 4 between 1995 and 2000. Government liberalized the financial sector, unified the two-tier exchange rate system and removed credit and interest rate controls. Although the exchange rate was fixed, it was pegged at market levels hence the black market became non existent. The Fraser ranking for black market exchange rates reached a peak of 9.8 in 1995 but dropped to 0 in 2000. Therefore, the reintroduction of price controls on basic commodities, exchange rate over-valuation post 2000 and concessionary loans among other things, manifested a distinct policy shift towards greater market intervention.

These new interventionist policies have implications for both the levels and distribution of social outcomes. Changes in food consumption, health outcomes and wealth inequality after the policy changes since 2000, are empirically assessed in the next two sections. Section 4.3 introduces the data and focuses on measurement of changes in wealth inequality, food consumption and health outcomes. Section 4.4 investigates the contribution of changes in food consumption on changes in health outcomes. An explanation of how market distortions contributed to the observed changes in outcomes is then provided in section 4.5.

4.3 Measuring changes in wealth, food consumption and health outcomes after the policy shift

This section seeks to establish that wealth inequality increased and food consumption declined especially among the poor, resulting in increased food consumption inequality and deteriorating health outcomes after the policy shift. Thus taking the year 1999 as

a point of reference, changes in wealth, food consumption and child health outcomes from their 1999 levels are analyzed. Assuming similar population characteristics before and after 2000, one would expect similar health outcomes before and after 1999 if the policy environment had not changed. Therefore, if the 1999 and post 2000 samples are comparable in all aspects other than policy regimes, then differences in health outcomes are attributable to the policy change.

4.3.1 Data and measurement of variables

DHS data for the 1999 and 2005/06 surveys are used for the analysis. From each survey, only children aged 5 years and under are selected. This gives two samples, each comprising only children aged 5 years or under. One is selected from the 2005/06 DHS and consists of only children born after 1999. The other is obtained from the 1999 DHS and comprises similarly aged children born before or during 1999. This facilitates a distinct comparison of health outcomes for the two periods. Measures from the 1999 DHS data reflect the state of outcomes just before the policy change while measures from the 2005/06 DHS data will reflect the state of outcomes after the policy changes. Limiting the analysis of consumption and health outcomes to under 5 children removes overlaps and aids the identification of the impact of the policy changes on these outcomes.

The number of selected children from the 1999 DHS and the 2005/06 DHS is 3892 and 5943 respectively. Urban observations constituted 23.4% and 25% of the 1999 and 2005/06 samples respectively. Both samples have an almost equal gender split (almost 50% females) and similar age composition. The summary statistics are presented in table A.4 and shall be further discussed in section 4.4.3 when the comparability of the two samples is closely scrutinized.

Measures for child health status

The assessment of changes in health outcomes is based on height for age z-scores (HAZ) and weight for age z-scores (WAZ). The HAZ and WAZ are computed from WHO growth standards. Anthropometric measures are widely used and preferred because of their objectivity (see Wagstaff, van Doorslaer & Watanabe 2003, Pradhan, Sahn & Younger 2003, Sahn & Younger 2005). They do not have self reporting errors while measurement errors are likely to be random. Furthermore, the distribution of healthy children's height is the same for different ethnic and racial groups (Habitch et al. 1974), whereas that of adults is sensi-

tive to genetic variability and early childhood health shocks (i.e. factors experienced well before the distortions in this case).

The z-scores capture the extent to which a child's height/weight conditional on age and gender, differs from that of a healthy reference population. A negative/positive z-score implies that a child is below/above the median of the distribution of healthy children. The mean HAZ and WAZ are respectively -1.17 and -0.61 in 1999 and -1.36 and -0.69 in 2005/06. These negative means imply that Zimbabwean children are below the reference child growth standards. The means for 2005/06 are lower than in 1999. The differences are statistically significant. This indicates a worsening of health outcomes on average in 2005/06. Using -2 standard deviations as the height/weight poverty line, the prevalence of stunting increased from 32.6% in 1999 to 34.1% in 2005/06 and the prevalence of underweight children increased from 12.1% to 13.9%. These statistics show worsening health among children in Zimbabwe.

Food consumption index

The key variable of interest is food consumption, which is proxied by a food consumption index. The index is constructed by summing up 11 food items consumed by the child based on responses to questions on consumption of specific food items in the DHS. Among selected food items are consumption of legumes, vegetables, meat, vitamin A fruits, other fruits, grains, cereals and milk products (see subsection 4.A.2 in appendix 4.A for a detailed explanation). The constructed food consumption index for 1999 has a mean of 3.41, mode of 4 and lower and upper quartiles of 2 and 5 respectively. In 2005/06 the mean is 2.24, mode is 1 and lower and upper quartiles are 1 and 3 respectively. These are lower than the corresponding food consumption mean and quartiles for 1999. A weakness of using this proxy is that DHS food consumption data is recall rather than concurrent data. This could overstate changes in the index cross time if recall periods differ substantially, which is not the case in this study. Nevertheless, the fact should be kept in mind when analyzing the data.

Variations of similarly constructed measures (i.e. the dietary diversity index and food variety index) have been widely used in the literature and found to be positively correlated with greater nutrition intake of nutrients in developing countries (see Hatloy et al. 1998, Hatloy et al. 2000, Onyango et al. 1998, Steyn et al. 2006, Moursi et al. 2008). Using DHS data from 11 developing countries including Zimbabwe, Arimond & Ruel (2004) found a positive association between the dietary diversity index and HAZ even after controlling

for socioeconomic status and concluded that the index has an effect on HAZ that is independent of wealth. Their results show that changes in the index had the greatest impact on mean HAZ among children in Zimbabwe. This confirms the validity of the index for Zimbabwe and its use in this study.

Measuring wealth from asset ownership variables

Measuring income or wealth and its inequality requires income or expenditure information which is not available from the DHS data. However, DHS contains information on asset ownership. Following recent literature (Vyas & Kumaranayake 2006, McKenzie 2005, Bollen, Glanville & Stecklov 2002, Filmer & Pritchett 2001), this information is used to extract a proxy for wealth using principal component analysis (PCA). In this case, the first principal component extracted from asset ownership variables is used to proxy for household wealth. Filmer & Pritchett used data for Pakistan, Indonesia and Nepal, to show that an asset index derived from PCA produces internally coherent results that are consistent with those based on expenditure data. More support for use of the asset based index is provided by Sahn & Stifel (2003). They find that an asset index derived from PCA is a good predictor of stunting among children. A detailed explanation of the asset index is provided in the first subsection of appendix 4.A.

4.3.2 Empirical estimation

Changes in wealth inequality

Wealth inequality is measured from the asset index. By construction, the asset index has zero mean. Thus analysis of standard inequality measures such as the Theil Index and Gini coefficient is not feasible. Instead, an alternative measure of relative inequality proposed by McKenzie (2005) is used. The relative inequality of subgroup c in comparison to the entire sample's wealth distribution is denoted by I_c. Its computation is given by equation (4.1), where σ_c is the standard deviation of subgroup c's asset index and λ is the variance of the asset index for the entire sample. McKenzie (2005) shows that I_c satisfies properties of anonymity, scale independence, population independence and the Pigou-Dalton transfer property, the four standard axioms required of measure of inequality.

$$I_c = \frac{\sigma_c}{\sqrt{\lambda}} \tag{4.1}$$

Using this measure, the relative inequality in 1999 and 2005/6 are computed by first pooling the two data sets to generate a pooled asset index. From the pooled index, the standard deviation of the asset index in the 1999 sub sample (i.e. σ_{1999}) and the standard deviation on the asset index in the 2005/06 sub sample (i.e. $\sigma_{2005/6}$), are obtained and used to compute I_{1999} and $I_{2005/6}$ respectively. If $I_{2005/6} > I_{1999}$, then inequality is relatively higher in 2005/6 than in 1999.

Changes in food consumption and health inequality

Inequality in health outcomes and food consumption by socioeconomic status is computed using the Kakwani et al. (1997) concentration index. The asset index is used as the welfare variable upon which socioeconomic ranking is based. For a population of size N, the Kakwani concentration index is given by equation (4.2), where R_j is a child's fractional rank in the socioeconomic distribution, μ is the overall mean of the outcome of interest, f_j is the population share of children in socioeconomic group y_j and μ_j is the mean outcome for children in socioeconomic group y_j. The test of significance of the concentration index is based on the standard t-test (see Kakwani et al. 1997)[1].

$$C = \frac{2}{\mu}\sum_j f_j \mu_j R_j - 1 \tag{4.2}$$

.

When the outcome is good e.g. food consumption, a positive C implies inequality in favor of higher socioeconomic groups. If the outcome is bad e.g. stunting and underweight, a negative C implies inequality in favor of higher socioeconomic groups.

4.3.3 Results

The McKenzie index shows an increase in wealth inequality 5 years into the new policy regime. The index for 1999 is 0.91 and that of 2005/06 is 1.06. This implies that wealth

[1]The variance of the index is

$$Var(C) = \frac{1}{N}(\sum(f_j a_j^2 - (1+C)^2) + \frac{1}{N\mu^2}\sum f_j \sigma_j^2 (2R_j - 1 - C)^2 \tag{4.2a}$$

$$a = (2R_j - 1 - C)\frac{\mu_j}{\mu} + 2 - q_{j-1} - q_j \; ; q_t = \sum_{i=1}^{j} f_i \mu_i \; ; \; q_0 = 0 \tag{4.2b}$$

where σ_j is the standard errors of the group means μ_j and a is given by the expression in (4.2b)

inequality in 2005/06 was 16% relatively higher than wealth inequality in 1999. Therefore, the shift in policy towards greater government intervention in markets created an environment suitable for widening wealth inequality. This widening difference in command of resources increases differences in access to food and health outcomes by various socioeconomic groups.

Table 4.1 presents means of food consumption, HAZ and WAZ by asset quartiles. Food consumption declined from an average of 3.41 items in 1999 to 2.24 items in 2005/06. This translates to a 34.1% decline in items consumed. This decline cut across all asset quartiles. However, the 23.6% decline in consumption for children in the richest quartile is significantly below the average for the entire sample. The largest proportionate decline was in the poorest quartile where the mean declined by 39.5% followed by the upper middle class (3^{rd} quartile) with a 37.7% decline. The largest absolute decline in food consumption was for the 3^{rd} quartile, followed by the 2^{nd} quartile. The richest quartile had the least decline in food consumption both in absolute and proportionate terms. In both samples, children in richer asset quartiles consumed more food items than children in poorer quartiles. As such, the impact of the decline in food consumption should be more severe on the poorer children. These findings are consistent with the observed widening gap in the command over resources between the poor and the rich in 2005/06. Asset quartiles were held at their 1999 values for calculating means for 2005/06 sample. Similar patterns are observed when the 2005/06 asset quartiles are used (see table A.2 in appendix A).

Stunting and wasting increased. Mean HAZ and WAZ declined between 1999 and 2005/06 for all levels of wealth. Mean HAZ declined by 16.5% from -1.17 to -1.36 standard deviations from the median of the reference healthy children. Mean WAZ declined by 13.1% from -0.61 to -0.70. Generally, mean HAZ and WAZ remained higher for children in richer

Table 4.1. Means of food index, HAZ and WAZ by asset quartiles

	Food Index			**HAZ**			**WAZ**		
Asset Range	1999	2005	%Δ	1999	2005	%Δ	1999	2005	%Δ
poorest 25 %	2.76	1.67	-39.49	-1.38	-1.49	-7.79	-0.83	-0.95	-14.46
26 - 50 %	3.15	2.04	-35.24	-1.18	-1.36	-15.25	-0.69	-0.81	-17.39
51 - 75 %	3.55	2.21	-37.75	-1.09	-1.41	-29.36	-0.55	-0.60	-9.09
richest 25%	4.23	3.23	-23.64	-0.97	-1.16	-19.59	-0.32	-0.36	-12.50
All	3.41	2.24	-34.12	-1.17	-1.36	-16.52	-0.61	-0.69	-13.11

quartiles. The only exception is mean HAZ in the 3^{rd} asset quartile which was lower than mean HAZ in the 2^{nd} quartile in 2005/06. Mean HAZ in this quartile had the largest decline both in absolute terms (decline by 0.32) and relative terms (decline of 29.3%). Mean food consumption for this quartile had largest absolute decline too. The lowest decline was in mean HAZ of the poorest quartiles. At -1.38 in 1999, the scope for a decline in mean HAZ was relatively lower for the poorest quartiles when compared to the highest quartiles.

The pattern of the decline in the mean HAZ suggests a greater worsening of health outcome in the middle asset quartiles. For WAZ, the pattern shows a larger decline in the means for the poorest and second poorest quartiles. Changes in the gaps between mean HAZ and WAZ of adjacent asset quartiles are greatest in the middle of the asset distribution. For example, the gap in mean HAZ of the richest 25% and the second richest 25% more than doubled from 0.12 to 0.25 while the gap between the second richest 25% and the second poorest 25% actually declined due to a bigger decline in the mean HAZ in the 2^{nd} poorest quartile. The gap between the poorest and second poorest 25% declined from 0.20 to 0.13. A similar pattern can be observed with WAZ. The decline in the gap between means of HAZ and WAZ of poorer children and those in the middle class is due to a larger worsening in outcomes in the middle class rather than improvements among the poor. This is a negative rather than a positive development.

Table 4.2 presents concentration indices, their standard errors, changes in the concentration indices and means for HAZ, WAZ and food consumption between 1999 and 2005/06. In addition, the table presents these statistics for other important determinants of child health outcomes. The concentration indices are based on asset indices calculated separately for each year but using common asset indicators across the years. Reassuringly, the choice of the asset index did not seem to change the estimated concentration index (see table A.3 in the appendix A). In any case, the Kakwani concentration index is insensitive to changes in the distribution of the welfare variable. It captures only changes in distribution of the variable of interest across the different socioeconomic groups (O'Donnell et al. 2007)[pp98]. This implies that we capture only the change in food consumption inequality for example, that is driven only by the change in access to food by socioeconomic status.

For easy of interpretation, the concentration index is calculated for the negative of the z-scores of height and weight for age. The reported negative concentration for these variables indicate a more than proportionately higher incidence of stunting and underweight among the poor over the two periods. The direction of change is conflicting. Underweight shows

an increase in inequality while stunting shows a decline in inequality although inequality remains. The predicted extent of inequality, is greater for underweight.

Food consumption inequality increased. This is shown by an increase in the concentration index from 0.095 in 1999 to 0.141 in 2005/06. Both indices are significantly different from zero. The change in the concentration index (of 0.046) is 48% of the 1999 value implying a substantial relative increase in food consumption inequality. Other notable increases in inequality are in access to safe water (0.037), access to sanitation (0.043) and incidence of diarrhea (-0.057). Since diarrhea is a bad outcome, the negative change shows an increase in inequality. Poor households also became larger in size relative the richer households. All is not gloom however. A notable improvement is observed in the level of household head education, as evidenced by the reduction in inequality (change of -0.038 or 23% drop).

With the exception of diarrhea, changes by 100% or above are generally on variables whose concentration indices are not statistically different from zero. Therefore, nothing

Table 4.2. Variable means and concentration indices

	1999			**2005**			
Variable	Mean	C index	Std Error[a]	Mean	C index	Std Error[a]	Δ C
Stunting[b]	1.168	-0.072	0.016	1.361	-0.048	0.010	0.024
Underweight[b]	0.608	-0.181	0.021	0.695	-0.193	0.016	-0.012
Food consumption	3.406	0.095	0.006	2.244	0.141	0.007	0.046
Lives in rural area	0.766	-0.220	0.007	0.750	-0.233	0.005	-0.013
Has sanitation	0.633	0.232	0.275	0.601	0.275	0.006	0.043
Has safe water	0.765	0.104	0.005	0.701	0.141	0.005	0.037
No of children	1.747	-0.049	0.005	1.812	-0.050	0.003	-0.002
Household size	6.174	-0.030	0.004	6.155	-0.016	0.003	0.013
Female headed household	0.367	-0.087	0.012	0.348	-0.088	0.010	-0.001
Household head age	42.2	-0.038	0.003	42.34	-0.015	0.003	0.023
Household head educ	6.458	0.165	0.005	6.852	0.126	0.004	-0.038
Mothers's education	4.431	-0.041	0.005	4.282	-0.043	0.003	-0.002
Age in months	29.613	-0.002	0.005	30.015	-0.002	0.004	0.000
Gender (female=1)	0.496	0.004	0.004	0.499	0.008	0.007	0.004
Was born small	0.160	-0.062	0.024	0.150	-0.068	0.020	-0.006
Breastfeeding duration	15.955	-0.014	0.005	15.310	-0.024	0.005	-0.010
Has diarrhea	0.140	-0.042	0.025	0.131	-0.099	0.021	-0.057
Has fever	0.256	-0.023	0.018	0.084	-0.054	0.027	-0.031
Coughs	0.399	-0.028	0.013	0.224	-0.094	0.015	-0.066

a - This is the standard error of the concentration index

b - These are based on the negative of HAZ and WAZ

much should be read from the relative changes in the concentration indices for variables like fever, coughs and gender of the child whose indices are not statistically different from zero in both periods.

The observed increase in food consumption inequality is consistent with the hypothesis that market distortions increased inequality in food consumption due to asymmetric access to food, the creation of exclusive rents and an economic contraction that was disproportionately borne by the poor. This is vindicated by the relative increase in wealth inequality in 2005/06. Higher levels of wealth inequality imply greater concentration of resources in the hands of the richer households. This contributed to the 48% change in the concentration index of the food consumption index. Due to limited access, poor households' range of consumed food items declined. Such a reduction in food variety has negative consequences for nutritional intake, translating into poorer health among the poor (see Moursi et al. 2008, Steyn et al. 2006, Hatloy et al. 2000, Onyango et al. 1998).

HAZ for children in the middle classes worsened by big magnitudes which brought them closer to HAZ for poorer children. This is responsible for the perceived decline in stunting inequality. The same reasoning applies for the modest increase in WAZ inequality. In relation to patterns in food consumption, two offsetting effects on health outcomes can be observed post 2000. On one hand, the mean of food consumption declined significantly in the middle quartiles of the wealth distribution. This brought them closer to those of poorer households thus reducing health inequality. On the other hand, inequality in food consumption increased. This effect increases inequality in health outcomes.

Due to the presence of confounding effects, the observed declines in HAZ and WAZ may not be wholly attributable to the reduction in the consumption of food. A deterioration in other determinants of health also reduce the mean HAZ and WAZ while improvements have the opposite effect. Similarly, reduced inequality in other determinants of health e.g education, mask the impact of increased inequality in food consumption on health outcomes. Furthermore, the observed change in health inequality depends on whether the effect of increased inequality in consumption is stronger than the effect of declining means. Therefore, a multivariate analysis of the determinants of health outcomes is necessary for measuring the impact of declining food consumption. A decomposition of the sources of changes in health inequality sheds more light on the contribution of the decline in mean food consumption and increased inequality in food consumption on health outcomes. The next section investigates the impact of declining consumption and decomposes the sources of changes in health inequality.

4.4 Empirical assessment of the impact of changes in food consumption

The association of declining means in food consumption and declining means for HAZ and WAZ is insufficient to establish a causal link between market distortions and health outcomes through the impact distortions have on access to food. Further analysis is made to identify the source of changes in health outcomes. Similarly, increases in food consumption inequality may not be reflected in ultimate increases in health inequality due to the presence of confounding effects and the offsetting effect of declining means. This necessitates a decomposition of changes in health inequality.

4.4.1 Measuring the impact of food consumption on health outcomes

The impact of a decline in food consumption on health outcomes can be analyzed using the regression in equation 4.3. H_i is a measure of child i's health outcome, FVS is the food index and β_0 is the impact of food consumption on the health outcome. Other determinants of the health outcome are denoted by a $k \times 1$ matrix $\mathbf{X}$ and ϵ_i is the disturbance term. This regression is based on a standard specification that includes community, household and child specific determinants of health (e.g. Lavy et al. 1996, Ponce et al. 1998, Case et al. 2002).

$$H_i = \alpha + \beta_0 FVS_i + \sum_k \beta_k x_{ki} + \epsilon_i \tag{4.3}$$

The community effects include dummies for rural-urban classification, access to sanitation and access to safe water. A household is considered to have access to sanitation if it has either a flush toilet, blair toilet or pit latrine. It has access to safe water if it has access to either treated pipe water, boreholes or protected wells. Household variables include household size, the number of under 5 years old children and the household head's age, years of education and gender (female household head takes a value of 1). Child specific variables include age in months, age squared, gender (girl child =1), mother's years of education and breast-feeding duration. Other child specific variables are illness dummies like whether a child had diarrhea, fever or coughed during the previous two weeks and the interaction of the food consumption index and whether the baby was breastfeeding.

The size of the child at birth is controlled for. This is captured by a dummy taking a value of one if the baby was born smaller than average based on the mothers's recall of the child's size at birth. A child whose size at birth is below average has a lower HAZ and WAZ than a child whose size at birth is above average if the two grow at the same rate. This necessitates controlling for size at birth in order to isolate the true impact of a variation in food consumption on variations in HAZ and WAZ.

Selection issues

Some of the child specific variables are only captured for children whose mothers live in the households. There is no information on consumption, breast-feeding and illness for children who do not live with their mothers. As noted in Case et al. (2002) and Case, Paxson & Ableidinger (2004), expenditures on healthy food items are lower for children not living with their mothers. This may translate to higher prevalence of stunting and underweight among these children.

Indeed, besides height for age in 2005/06, the distributions of HAZ and WAZ of children living with their mothers have different means from those of children not living with their mothers. As shown in figures B.1 and B.2 presented in appendix B, children living with their mothers are generally better-off. Tests for equality of means between children with present and absent mothers are rejected for all but height for age in 2005/06. This indicates that on average, children living with their mothers are better off.

To avoid potential selection bias, the regression in equation (4.4) is estimated using the Heckman selection procedure based on mother presence in a household. A father presence dummy is constructed and used as the excluded variable. This dummy takes a value of one if a father is dead or existence is not known and a value of zero otherwise. The use of father presence assumes that a father's non-existence influences the likelihood of staying with a relative in two ways. Either both parents of the child are dead or that single mothers without support of the child's father are forced to leave the household and find work. Furthermore, a father' presence is presumed to affect child nutrition only through provision of resources. Once food consumption is controlled for, father presence should not be significant.

Results

Results from the regression of HAZ and WAZ on their determinants are shown in table A.6 in appendix A. In all regressions, the father alive dummy is a significant predictor of a mother's presence in the household. Mothers of children whose fathers are alive or their existence known are more likely to be members of their children's households. The father alive dummy was included in OLS regressions of HAZ and WAZ for only children whose mothers are present in their households. Its coefficient lost significance in all regressions once food consumption is controlled for. This confirms the validity of excluding the dummy in the final regressions.

Table 4.3 presents the impact of food consumption on HAZ and WAZ. The coefficient of the food consumption index was positive and significant in all regressions. For HAZ, the coefficient is around 0.06 in both years. This implies that greater food variety in consumption improves mean HAZ. A reduction in mean food consumption from the 1999 to the 2005 level reduced mean HAZ by 0.07. This is 37% of the overall decline in mean HAZ. The coefficient of the food index in the WAZ regression is 0.046 in 1999 and 0.0613. Mean WAZ in 2005 would have been higher by 0.05. This is 59% of the decline in the mean of WAZ. Thus the decline in food consumption significantly contributed to worsening health outcomes among children in Zimbabwe.

Children suffering from diarrhea have lower HAZ and WAZ on average. The coefficient of diarrhea is negative and significant for WAZ in 2005/06 and HAZ in both years. Diarrhea has an immediate effect on WAZ since it captures short term health shocks hence its significant impact is expected. The significant impact of diarrhea on HAZ for both years

Table 4.3. The impact of selected variables on HAZ and WAZ

	HAZ		WAZ	
Variable	1999	2005	1999	2005
Food index	0.0611***	0.0605***	0.0457***	0.0613***
	(0.0226)	(0.0228)	(0.0154)	(0.0173)
Was born small	-0.428***	-0.350***	-0.464***	-0.514***
	(0.0988)	(0.0864)	(0.0667)	(0.0652)
Has diarrhea	-0.277**	-0.219**	-0.119	-0.252***
	(0.109)	(0.0927)	(0.0727)	(0.0696)
Household head's education	0.0290**	0.00386	0.0291***	0.0295***
	(0.0125)	(0.0120)	(0.00834)	(0.00903)

*** p<0.01, ** p<0.05, * p<0.1, Standard errors in parentheses

indicates that diarrhea is also capturing long term or recurring illness e.g. illness due to HIV/AIDS. Household head's years of education has a significant positive impact on HAZ and WAZ in all regression expect for HAZ in 2005/06. This implies that higher levels of households head's levels of education in 2005/06 improved health outcomes. People in their teens in the 1980s and 1990s benefited from increased investments in education in that period. These cohorts were household heads by 2005 hence the increase in average education. The positive impact of higher levels of education of household heads was more than offset by the decline in mean food consumption.

The measured impact of food consumption is obtained after controlling for the stature of the child at birth. Babies who were born small have lower HAZ and WAZ hence the significant negative coefficient of size at birth in all regressions. The coefficient of food consumption thus captures the pure effect of a variation in the consumption on child growth holding the child's size at birth and other variables constant. The significance of the food index coefficient confirms the declining food consumption contributed to worsening health outcomes in Zimbabwe. Food consumption is the second largest impact on HAZ and WAZ among variables that can be changed by policy after the child is born. It is one of the only two policy variables that are significant in all regressions.

The data show that children living in the same household had an identical FVS most of the time. This, together with the observation of children born to the same mothers in the sample, implies the possibility of cluster effects. Table A.7 in appendix A presents the Heckman regression results with clustered standard errors allowing for intra household correlation. The coefficient of the food consumption index remains significant in all four regressions. The conclusion that the decline in food consumption worsened stunting and underweight remains unchanged.

The above regression was also estimated using ordinary least squares on those children living with their mothers only, since these are the only children for which food consumption and illness variables are observed. The coefficient of food consumption remain positive and significant in all regressions for HAZ and WAZ. However, while the estimated coefficient for food consumption are very close to the Heckman estimations in 1999 regressions, they are larger in the 2005/06 sample in both HAZ and WAZ regressions. These regression results are presented in table A.8 in appendix A. From the results, it is also concluded that a decline in food consumption worsened child health outcomes.

4.4.2 The decomposition of changes in health inequality

The significance of the food index indicates the importance of availability of food for health outcomes among children in Zimbabwe. Differences in the consumption of food should lead to differences in health outcomes. The observed increase in inequality in food consumption translates to increased health inequality, holding other things constant. A decomposition proposed by Wagstaff et al. (2003) is used to establish the impact of an increase in inequality in food consumption on the change in health inequality. This decomposition uses a multivariate regression framework to isolate changes in health inequality into three major components. These are: a) changes in the degree of inequality of determinants of health, b) changes in the means of these determinants and c) changes in the impacts of these determinants on health outcomes.

Let C be the Kakwani concentration index. Changes in C reflect the changes in health inequality. The decomposition of changes in child health inequality is made from estimates of a linear regression of H_i on a vector of its determinants as in regression 4.3. This regression is rewritten in equation (4.4), where $\mathbf{X}$ now includes food consumption.

$$H_i = \alpha + \sum_k \beta_k x_{ki} + \epsilon_i \tag{4.4}$$

Wagstaff et al. (2003) showed that given (4.4) the concentration index can be expressed as in (4.5) where C_k is the concentration index for variable k, $\overline{x}_k$ is its mean and μ is the mean of H_i. In the second term of the right hand side, GC_ϵ is the generalized concentration index for ϵ_i which can be computed as a residual.

$$C = \sum_k (\beta_k \overline{x}_k / \mu) C_k + GC_\epsilon / \mu \tag{4.5}$$

The decomposition of changes in the concentration index is derived from the total differentiation of (4.5) to give (4.6). Allowing for both the direct impact of α, β_k, $\overline{x}_k$ and C_k on C and their indirect impact through μ, the total differentiation of C is approximated by (4.7) after some manipulations[2].

[2]From (4.5); $\frac{dC}{d\mu} = -\sum_k \frac{\beta_k \overline{x}_k}{\mu^2} - \frac{GC_\epsilon}{\mu^2} = -\frac{C}{\mu}$ and from (4.4); $\mu = \alpha + \sum_k \beta_k \overline{x}_k$ hence $\frac{d\mu}{d\alpha} = 1$; $\frac{d\mu}{d\beta_k} = \overline{x}_k$; $\frac{d\mu}{d\overline{x}_k} = \beta_k$. This implies the expressions below, from which we obtain (4.7) after substituting them into (4.6):
$\frac{dC}{d\alpha} = \frac{dC}{d\mu}\frac{d\mu}{d\alpha} = -\frac{1}{\mu}C$; $\frac{dC}{d\beta_k} = \frac{dC}{d\beta} + \frac{dC}{d\mu}\frac{d\mu}{d\beta_k} = \frac{\overline{x}_k}{\mu}(C_k - C)$; $\frac{dC}{d\overline{x}_k} = \frac{dC}{d\overline{x}} + \frac{dC}{d\mu}\frac{d\mu}{d\overline{x}_k} = \frac{\beta_k}{\mu}(C_k - C)$

$$dC = \frac{dC}{d\alpha}d\alpha + \sum_k \frac{dC}{d\beta_k}d\beta_k + \sum_k \frac{dC}{d\overline{x}_k}d\overline{x}_k + \sum_k \frac{dC}{dC_k}dC_k + dGC_\epsilon/\mu \tag{4.6}$$

$$dC = -\frac{C}{\mu}d\alpha + \sum_k \frac{\overline{x}_k}{\mu}(C_k - C)d\beta_k + \sum_k \frac{\beta_k}{\mu}(C_k - C)d\overline{x}_k + \sum_k \frac{\beta_k\overline{x}_k}{\mu}dC_k + dGC_\epsilon/\mu \tag{4.7}$$

The second component of (4.7) shows the impact of a change in coefficients and the third component shows the impact of a change in the determinants' means. The fourth component shows the impact of changes in inequality of the determinants on the overall change in health inequality. This fourth component is the one pivotal in establishing the link between changes in inequality in food consumption and changes in health inequality. Using the neo-materialism interpretation of health inequality, I argue that policy changes post 2000 led to increased health inequality through the resulting asymmetry in access to food across the wealth distribution. To substantiate the argument, the fourth component of the decomposition in equation (4.7) should indicate a significant impact of the increase in food inequality on the overall change in health inequality. Since the regression controls for confounding effects, the outcome of this decomposition establishes the link between the policy shift and increased health inequality via increased food consumption inequality.

Results

Results from the decomposition of the change in health inequality are presented in table 4.4. For both stunting and underweight, the increase in food consumption inequality had a large adverse impact on health inequality. For stunting, the effect of increased food consumption inequality on overall health inequality is 11% of the 1999 concentration index or 33% of the total change in stunting inequality. This implies that stunting inequality may have improved by a greater magnitude if food inequality had not increased. For underweight, the change attributable to increased food consumption inequality is 6% of the 1999 concentration index. The decomposition thus reveals that changes in food consumption inequality had a large negative impact on health inequality.

The adverse effects of the increase in food consumption inequality can be put into context by noting that it wiped out the benefits of reduced inequality in the household heads's levels of education. The change in inequality in stunting and underweight attributable to a reduction in education inequality was 8% and 7% of the 1999 concentration index

Table 4.4. Total differential decomposition of changes in stunting and underweight inequality

	Stunting				**Underweight**			
Variable	ΔC_k	$\Delta \overline{X}_k$	$\Delta \beta$	$\frac{\Delta C_k}{C_{1999}}$	ΔC_k	$\Delta \overline{X}_k$	$\Delta \beta$	$\frac{\Delta C_k}{C_{1999}}$
Food consumption	**-0.0082**	**0.0102**	0.0003	**11.28**	**-0.0117**	**0.0242**	-0.0242	**6.49**
Lives in rural area	0.0008	-0.0002	-0.0306	-1.08	-0.0016	0.0001	-0.0027	0.90
Has sanitation	-0.0029	0.0010	0.0220	3.97	-0.0030	0.0014	-0.0356	1.65
Has safe water	-0.0024	0.0009	0.0265	3.28	-0.0031	0.0020	0.0248	1.69
No of children	-0.0002	0.0001	-0.0003	0.29	-0.0008	0.0025	0.0202	0.45
No of children squared	0.0002	0.0000	0.0005	-0.25	-0.0020	-0.0012	0.0020	1.11
Household size	-0.0007	0.0000	0.0014	0.93	0.0018	-0.0001	-0.0370	-1.01
Female headed household	-0.0001	0.0001	0.0006	0.10	-0.0001	-0.0003	-0.0054	0.03
Household head age	0.0161	0.0001	0.0095	-22.29	-0.0264	-0.0005	0.2197	14.57
Household head age-sqrd	-0.0063	0.0000	0.0004	8.72	0.0307	0.0008	-0.0697	-16.94
Household head educ	0.0061	-0.0023	0.0330	-8.47	0.0118	-0.0065	-0.0016	-6.53
Mother's education	0.0002	0.0001	0.0018	-0.30	0.0001	0.0003	0.0015	-0.08
Age in months	0.0006	0.0032	0.0277	-0.76	0.0004	0.0065	0.1886	-0.24
Age squared	0.0014	-0.0029	-0.0122	-1.96	0.0010	-0.0052	-0.1014	-0.53
Gender	-0.0004	0.0000	0.0017	0.62	-0.0007	-0.0002	0.0088	0.37
Was born small	-0.0004	0.0000	-0.0001	0.47	-0.0007	-0.0009	0.0016	0.40
Breastfeeding duration	0.0003	0.0001	-0.0097	-0.44	-0.0024	-0.0017	-0.0493	1.32
Food*breastfeeding	0.0000	0.0000	0.0111	0.05	0.0007	-0.0002	0.0110	-0.37
Has diarrhea	-0.0019	-0.0001	-0.0002	2.64	-0.0016	-0.0003	0.0043	0.87
Has fever	0.0004	0.0004	0.0006	-0.51	-0.0030	-0.0102	0.0005	1.67
Coughs	-0.0007	-0.0002	0.0004	0.89	-0.001	-0.0016	-0.0054	0.87

Note: The figures are presented as percentages of the 1999 concentration index

respectively. This means that increased food consumption inequality offset the positive impact of a reduction in education inequality. For stunting, the contribution of the effect of a change in the effectiveness of education was high and reinforced the effect of the reduction in education inequality.

Increases in inequality in access to sanitation and safe water both contributed to increased inequality in stunting and underweight. However, the magnitudes of their contribution are smaller than the effects of food consumption and education. The contribution of changes in inequality in illness variables, birth size, breast feeding duration, household size, household head gender are negligible. A surprisingly large contribution is the impact of a reduction in inequality of the household head age which reduced both stunting and underweight inequality. The effect, which is as high as 22% of the 1999 concentration index, countered worsening health inequality from the impact of most changes in inequality of the other determinants of health status.

Changes in means generally had a negligible impact on stunting and underweight inequality. Food consumption is a notable exception. The reduction in the mean of food consumption contributed to improvements in stunting inequality. The effect of a reduction in the mean of food consumption contributed to decrease in the concentration index for stunting by 0.01. This is equivalent to a 14% decline in the concentration index for stunting from its 1999 level of -0.07. This effect outweighed the impact of increased inequality in food consumption. It confirms that the measured decline in stunting inequality is partly a result of worsening consumption and HAZ in the middle of the distribution. The contribution of a reduction in food consumption on WAZ is equally dominant. It reduces the underweight concentration index by 0.024 (i.e. 13% of the underweight concentration index in 1999).

Under the new interventionist policy environment, food consumption declined concurrently with an increase in food consumption inequality. The increase in food consumption increased health inequality. The reduction in the mean of food consumption worsened health outcomes for everyone but weighed heavily on health outcomes for children in the middle wealth groups. This worsened their health outcomes to bring them closer to outcomes for the poor. This effect masked the impact of increased inequality in food consumption. In terms of changes in health outcomes, the middle class were evidently the biggest losers from changes in access to food after the policy shift. There are no runaway winners, but the richer children were certainly not affected as much as poorer children were.

A common problem with decompositions is change in significance of variables over time. This is not an issue for food consumption since its coefficient is significant in all regres-

sions. Other child specific variables like gender, age and size at birth are also significant in all regressions. If the coefficient is significant in the first period, i.e. 1999, its loss of significance in the next period primarily affects the component of the decomposition attributable to changes in the magnitude of the variable's impact. Thus some caution is needed in the interpretation of decompositions of some variables like diarrhea in the WAZ regressions and household head's level of education in the HAZ regressions for example.

4.4.3 Any other factors captured in the measured impact of food consumption?

Although the decline in food consumption and increases in its inequality can be explained as outcomes of the policy shift, it is necessary to establish that no other factors influenced food consumption levels, its inequality and its measured impact. Possible explanations include data changes, increases in HIV prevalence, demographic changes, natural disasters, disease outbreaks and droughts. Each of these factors is considered below.

Data comparability

The DHS data have consistently been collected using the same sampling techniques over the years. This makes two DHS samples easily comparable. Indeed, from the summary statics presented in table A.4, the 1999 DHS and 2005/06 DHS are similar with respect to the geographical, demographic and household composition. Rural observations constitute 76.6% and 75% of the 1999 and 2005/06 DHS respectively. Equally comparable is the samples' gender composition, mother presence in households and household relation structure. Females are almost 50% in both samples while the household's head gender split differs only by 2% (with 63% male household heads in 1999 against 65% in 2005/06). In both samples about 15% of the children's mothers are not members of the households. The mean age of mothers in the two samples are almost equal at 27.9 years in 1999 and 27.7 years in 2005. From figure B.3, one cannot say that children were born to older mothers in one sample than the other. The relation of children to the household head are not significantly different either, with 64% and 63% of children in 1999 and 2005/06 being sons/daughters of the household head respectively. Grand children in 1999 and 2005/06 respectively constitute 27% and 28% of the sample.

However, households in the 2005/06 sample had more people around the mode in 2005/06 as shown in figure B.4. Nevertheless, the shape of the distributions of household size be-

tween the two samples in strikingly similar. The increase in frequency in the middle might be a reflection of coping mechanisms as people adjusted to income pressure and the clean up campaign, "Operation Murambatsvina[3]". This clean up campaign disproportionately affected the poor. The majority of the victims returned to live with their extended families thus increasing their household sizes. The number of children in a household is highly associated with HAZ (Rona et al. 2003) and affects the spread of resources. Therefore, the regression controls for the number of children in the household and the household size. This weeds out potential effect of "Operation Murambatsvina". The operation did not change the mean incomes since the informal sector had resurfaced in a different form by the time of the survey. Increased household sizes due to the operation also meant pooling of income as households were integrated. Therefore the impact of "Operation Murambatsvina" on mean food consumption is minimal.

Droughts and natural disasters

Among other possible explanations for the decline in mean food consumption and increase in its inequality include natural disasters, disease outbreaks and droughts. There were no major natural disasters and disease outbreaks that could have affected food consumption and health outcomes in this period. The pattern of food production between 2000 and 2005 closely mirrors the pre 1999 period, despite the drought in 2002. Figure B.6 shows trends in food and agriculture production indices as well as maize yield. The production indices were computed using 1999 as the base year. These were obtained from the African Development Bank (2007) while maize yields were obtained from FAO/WFP's (2003) and (2004) crop and food assessment reports. The indicies show that drought in 1996 was as severe as the 2002 drought (see figure B.6 in appendix B). The biggest impact of the land reform was more on non food production. This is evidenced by the continued downward trend in the aggregate agriculture index which began to diverge from food production trends. The FAO/WFP crop and food assessment reports also show a decline in non food crops such as tobacco, while that of cereals seems to mirror pre 1999 trends.

Food production did not change although productivity declined after the Fast Track Land Reform Programme. The decline in productivity was compensated by increased acreage as newly resettled farmers shifted production away from cash crops to food crops. This

[3]This was implemented in May and June 2005. During this operation, shacks and unauthorized back yard structures in urban and semi-urban areas were demolished. This left occupants of these structures without immediate accommodation. Most resorted to living with their extended families. Since these structures were dominant in high density areas, the majority of displaced people were at the lower end of the income distribution

maintained food production. Differences in access to food after 2000 can therefore be explained by policy changes other than land reform post 1999. Among them are controls on the price and marketing of grains. Any impact these have on reducing food consumption is an outcome of the policy shift towards greater intervention since 2000. The reduction in mean food consumption and the increase in its inequality in 2005/06 cannot be attributed to droughts.

HIV and AIDS

The impact of food consumption inequality on health inequality is overstated if an increase in HIV/AIDS is higher among the poor. Trends of HIV prevalence in the country actually ease this concern. According to trends from estimates by the Ministry of Health and Child Welfare in conjunction with WHO (see figures B.5 in appendix B), there was a decline in HIV prevalence across all area classifications after the pandemic reached a peak in 1995. These trends are supported by other estimates (see UNGASS 2006, UNGASS 2008). Even the most pessimistic projections show a flattening of the trend after 1994 (Mugurungi et al. 2008). These trends were compiled using the most recent technique in HIV prevalence (EPP) hence statistical methodology can not be attributed to the decline. The report by UNAIDS (2005), which sought a thorough investigation of whether the declines are real or artificial, confirmed that HIV/AIDS declined even after taking migration and other factors into account.

The prevalence of HIV/AIDS is different between rural, urban and other areas. It is lowest in rural areas (Mugurungi et al. 2008) where the poorest live. A look at the DHS data shows that the sample proportions by area type have not changed between the two DHS. Hence they should be fairly comparable. Furthermore, there is no reason to assume that any attrition from urban to rural areas was predominantly by infected persons. Going by the most pessimistic trends showing a flattening out in the HIV prevalence trends, it can be argued that HIV and AIDS has no influence on the measured impact of increased food consumption. If alternatively the most optimistic projections are used, the measured impact of food consumption inequality gives the lower bound of the true impact since declines in HIV/AIDS should actually reduce the impact of food inequality.

I control for diarrhea, fever and coughing to obtain the pure impact of other determinants of HAZ and WAZ after removing the effect of illness. This is important if children excluded from the regression are predominantly HIV orphans who are themselves ill hence underweight or stunted. Results presented in table A.6 show that children with diarrhea

have lower height for age and weight for age z-scores. The concentration indices in table 4.2 show a higher incidence of diarrhea among the poor, with this inequality higher in 2005/06. However, the impact of this increased inequality on changes in health inequality is only modest while that of fever and coughing is negligible. The effect of food consumption is reduced in the presence of disease. The impact of food consumption on HAZ did not change between the two periods. This is inconsistent with large changes in unobserved long term or recurring illness due to HIV/AIDS. Therefore, increased inequality in stunting and underweight attributable to increased inequality in food consumption cannot be explained by changes in HIV/AIDS trends.

Demographic changes

Demographic characteristics for these two samples are similar to a large extent. Table A.5 in appendix A shows household population by age and sex, fertility rates, mean children ever born and infant mortality rates. From the table, the age profile of the households and fertility rates are similar across the two samples. In 2005 about 12% of household members in urban areas are aged between 5-9 while the same cohort in 1999, constituted 13%. Other similarities are in household proportions of the 0 - 4 age group in both rural (15% in 2005/06 against 14% in 1999) and urban areas (12% in 2005/06 against 13% in 1999). The 15 - 49 years old fertility rates in 2005 is 3.8 which is close to the 1999 rate of 4%. Equally similar are crude birth rates which at 31 births per 1000 population are equal. The general fertility rate only differs by 3 live births per 1000 females (137 in 2005/06 sample against 141 in the 1999 sample). The mean number of children ever born, and mean children leaving are within the same range.

There is a difference in the survival rates of underweight children at birth which increased in the 2005/06 sample. If ignored, this may reflect in reduced mean in HAZ and WAZ in 2005/06. The regression controls for birth size by including a dummy taking a value of one if the child was born smaller than the average. This eliminates the effect of birth size from the impact of food consumption. As shown in table 4.3, this dummy is significant. The increase in survival rates of underweight children at birth increases inequality is relatively more underweight children are now surviving in poor households. The concentration indices for 2005/06 and 1999 also show a proportionately higher incidence of small children at birth among the poor. This increased in 2005. However, as shown in table 4.4, the contribution of the increase in inequality in small children at birth to changes in inequality is negligible.

Migration

Migration reduces mean food consumption if it is disproportionately among the wealthier leaving behind a poorer population with lower levels of consumption. This does not seem to be the case from the data. The asset holdings of households in the upper distribution is higher in the 2005/06 sample (see figure 4.4 in appendix 4.A). The average education level in generally higher in 2005/06 across all quartiles. Furthermore, migrants send remittances home. Thus the remaining population in not necessarily poorer. Reported trends on migration only rose sharply in 2006 although there are no reliable official figures yet. This period is not captured in the 2005/06 sample. Therefore the reduction in mean food consumption can not be attributed to migration. The reduction in average consumption of food and the increase in its inequality are attributable to widespread distortions that prevailed after the policy shift. The next section explains the channels through which distortions reduced food consumption and increased inequality.

4.5 The impact of market distortions on wealth and food consumption

The relative increase in wealth inequality, the decline in food consumption and increases in its inequality post 1999, are attributable to the existence of widespread market distortions in that period. The impact of market distortions worked through three major channels that increased inequality at the same time reducing average consumption. Firstly, there was asymmetry in access to commodities due to shortages and exorbitant black market prices. Secondly, market distortions created exclusive rents for the elite engaged in rent seeking. Thirdly, distortions hastened an economic contraction which in its early period, was predominantly borne by low income earners. The first channel reduced consumption on average, the second increased inequality and the third effect disproportionately reduced consumption for the poor. These channels are discussed below.

4.5.1 Asymmetric access to commodities

Price controls led to reduced consumption and increased inequality in access to controlled commodities. This followed widespread shortages of commodities from retailers after price controls were introduced. Initially, there was hoarding (Chikukwa 2004) which generated

excess demand for the controlled commodities. Consequently a black market emerged where prices were out of reach for the majority of citizens except for the wealthy and those with privileged access (Bigsten & Durevall 2003). Raath, writing for The Times in 2003, made the following observation:

> In the townships, maize-meal and other staples are stacked in grimy stalls outside beer halls and at bus stops, but they come at ten times the legal price and no one outside the elite can afford the black market

This observation illustrates that price controls worked against the poor instead of serving them. Faced with shortages and high black market prices, most households responded by cutting down on consumption. Those with enough resources resorted to importing basic commodities both for own consumption and resale on the black market. This led to a large increase in the number of day-shoppers arriving in neighboring countries when compared to the 1999 figures (Hawkins 2003). Indeed, imports of food increased to almost triple their pre-price controls after 2001[4]. However, a lot of households failed to import food due to lack of access to foreign currency and various institutional constraints. For example, it took 6 months to obtain a passport in 2003 and speeding up the process usually required a bribe (Chikukwa 2004). Middle income households suffered the same fate as poorer households. Most could not afford the black market prices and were not able to cope with domestic shortages by importing basic commodities. Meanwhile, those with access to foreign currency at the official exchange rate, the more affluent and cross border traders, were better placed to benefit or cope with price controls. This disproportionately reduced food consumption of poorer households and increased consumption inequality.

4.5.2 Creation of exclusive rents

Market distortions generate rent seeking opportunities. However, only a privileged few can capture these rents and profit from existing distortions. In Zimbabwe, it was the elite who were better able to capture these rents because of their influence and stronger command over resources. Therefore market distortions created exclusive rents for the elite. This increased income for a small section of the population that was engaged in rent seeking while the majority's income dwindled. As a result, consumption for everyone else dropped by large margins while that of rent seekers was maintained. This explains the less than average reduction of food consumption by children in richer households.

[4]see food import figures from (IMF 2003, IMF 2005)

A particular case of exclusive rents was in the fuel market. In response to fuel shortages that began in 2001, the National Oil Company of Zimbabwe (NOCZIM) selectively issued companies and individuals with direct fuel import licences to import fuel strictly for company or personal use. Many licence holders abused the permits by selling the fuel on the black market. A case in point was Comoil, a company owned by a sibling of a ruling party MP. It sold petrol at ZWD 1 800 per liter yet the controlled price was ZWD 450 per liter (Chikukwa 2004)[pg 192]. The two tier pricing system introduced later in 2003 further created arbitrage opportunities. People with access to the cheaper fuel sold it on the black market at more than four times the price charged by NOCZIM. These were transport operators, high profile farmers and senior government officials (*Financial Gazette, 23-29 October* 2003, ANDNetwork Journalist 2006). Even the central bank governor later acknowledged that the system benefited a privileged few and caused leakages to the parallel market (Reserve Bank of Zimbabwe 2006).

Others examples of sources of exclusive rents were concessionary financing and exchange rate controls. Concessionary loans were a source of cheap money which mostly benefited entrepreneurs. Most recipients invested the money in the money market or other non-productive activities which generated quick returns. Exchange rate controls led to foreign currency shortages and a vibrant black market. This benefited people with access to cheap foreign currency at the official rate (mostly politicians, senior government officials, bankers and their connections (Chikukwa 2004)) and wealthier individuals who traded and speculated on the parallel market rate.

Meanwhile, most households, especially poorer households, failed to capture these exclusive rents. They were ineligible for receiving concessionary loans, neither did they have resources to participate in the buying and selling of foreign currency. This resulted in contrasting fortunes. Those with access to the rents increased their asset holdings in both the stock markets and real estate. This is vindicated by the improved performance of the Zimbabwe Stock Exchange (ZSE) and the real estate sector during this period. For example, the industrial index of the ZSE rose by 123% in 2002 (Reserve Bank of Zimbabwe 2003) and houses sold by some real estate agencies doubled (Swarns 2002) yet the economy had contracted by about 11.1% in that year. Thus exclusive rents widened income differences and consumption declined on average since rents benefited only a minority of the population. During the budget speech in November 2002, the Minister of Finance indeed acknowledged that real beneficiaries of price controls were black market dealers while ordinary citizens suffered even more.

4.5.3 Increased economic contraction

Besides their rent generating effects, market distortions contributed to an economic decline that hit the poor hard. Market distortions and the lack of respect for property rights under the land redistribution programme, are cited as the major causes of the economic contraction in Zimbabwe (see Bigsten & Durevall 2003, IMF 2003, IMF 2005, Clemens & Moss 2005). During the period 2000 to 2003, the economy had shrunk by 30% (Reserve Bank of Zimbabwe 2004a) and unemployment increased. The volume of manufacturing output for foodstuffs and stock feeds dropped by 9.9% and 25.5% in 2002 and 2003 respectively while that of the manufacturing sector as a whole dropped by 14.5% and 11.8% respectively (IMF 2004). This was largely blamed on price controls and foreign currency shortages caused by exchange rate over-valuation and controls (IMF 2003, Confederation of Zimbabwe Industries (CZI) 2003). The significant cuts in production by most companies led to layoffs, mostly targeting ordinary employees and casual workers. Thus economic contraction also disproportionately affected ordinary employees.

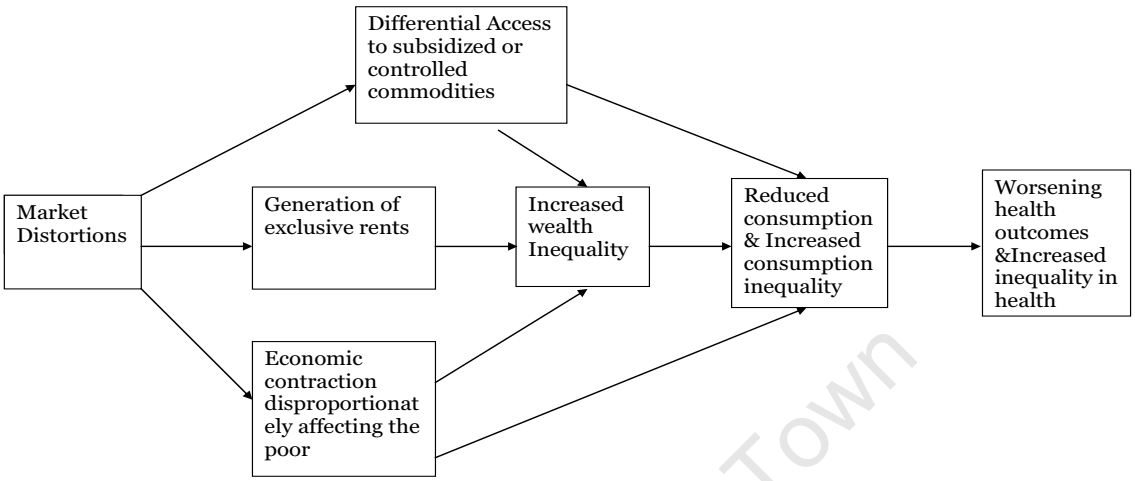
The above three factors, (i.e. asymmetric access to commodities, exclusive rents and economic contraction) led to a shift in the distribution of resources. They concentrated access to commodities among the wealthy and left the everyone else with minimal resources. These privileged few were able to increase their wealth and maintain their levels of consumption. On the other hand, poor and middle class individuals commanded fewer resources. Their consumption consequently declined. These contrasting fortunes led to a reduction in food consumption and the increase in inequalities in both wealth and food consumption observed in this chapter.

4.6 Discussion

Empirical findings of the chapter have established that inequality in wealth and food consumption increased after the policy changes post 1999. At the same time, food consumption declined while stunting and underweight increased across all asset quartiles on average. In addition, a significant adverse effect of an increase in inequality in food consumption on health inequality has been identified. All these can be explained as outcomes of the widespread distortions that originated from the policy changes. The schematic diagram in figure 4.3 summarizes the link between market distortions and these outcomes.

The figure highlights that market distortions in Zimbabwe led to asymmetric access to controlled commodities. This concentrated access to commodities among the wealthy re-

Figure 4.3. The impact of market distortions on health outcomes



sulting in food consumption inequality. In addition, market distortions created exclusive rents. This allowed rent seekers, chiefly the elite, to increase their wealth and general command over resources. They were able to maintain or even increase their consumption while every one else reduced theirs. Furthermore, market distortions hastened an economic contraction that disproportionately harmed the ordinary citizen. At the same time, incomes of rent seekers were increasing thus cushioning them from the economic decline. This allowed rent seekers to sustain their levels of consumption at a time when ordinary households were reducing theirs. The eventual outcome is a reduction in both the variety and level of food consumption households on average since rent seekers were in the minority.

Average consumption of food by poorer households was reduced by a greater magnitude compared to richer individuals since a majority of rent seekers and beneficiaries of distortions were the elite. This has been confirmed by findings in section 4.3. The findings revealed a reduction in the consumption of food across all quartiles. The greatest reduction in both absolute and relative terms is among the poor. Consistent with the above argument, children in richer households were the least affected. Market distortions reduced average food consumption across all quartiles but the effect was greater on poorer

households.

Food consumption is an important determinant of health among children. A reduction in food consumption worsens health outcomes for children. Empirical evidence from developing countries confirms that both the level and variety of food consumed are important for children's health. The importance of food remains even after controlling for socioeconomic status and other confounding effects (see Arimond & Ruel 2004). Hence by reducing access to food, market distortions consequently worsened health outcomes for children. Findings in this chapter confirm this. The coefficient of food consumption was positive and significant for both HAZ and WAZ. Its magnitude implies that the reduction in food consumption from its 1999 average reduced mean HAZ by 37% of the overall decline in mean HAZ. It reduced mean WAZ by 59% of the decline in mean WAZ. The policy shift towards greater intervention deepened poverty since it led to the decline in food consumption and worsened health outcomes.

The increase in consumption inequality increased health inequality among children. This is supported by empirical evidence from literature on child health inequality in other countries, specifically developing countries. In Vietnam, 10% of the increase in height for age inequality between 1993 and 1998 is accounted for by the increase in consumption inequality (Wagstaff et al. 2003). Results from the decomposition in section 4.4 show that an increase in food consumption inequality in Zimbabwe increased stunting inequality. Moradi & Baten (2005) note that large height differences between the elite and the poor have been observed in Nigeria, Ghana, Togo, Egypt, Haiti and some ethnic groups in Ethiopia. These differences are largely attributed to poorer conditions among the poor. This chapter confirms these findings. It finds that mean food consumption is higher for richer children and that health outcomes for richer children are better than outcomes for poorer children. Thus by concentrating access to resources and commodities among the wealthy while leaving the poor with minimal resources, market distortions would increase health differences between the poor and the rich.

These findings are consistent with the neo-material interpretation of health differences. According to this interpretation, health differences result from differential accumulation of exposures and experiences rooted in the material world (Lynch et al. 2000). The creation of exclusive rents and the asymmetric effects of an economic contraction caused in part by market distortions, influence individual private resources and the nature of public infrastructure. These affect factors like education, availability of food and health services which are important determinants of health status (see Pradhan et al. 2003). Similarly, asymmetric access to controlled commodities directly contributed to the decline in access

to food on average after the policy change. Difference in access to food led to differences in health outcomes over the two periods and across socioeconomic groups.

The measured decline in food consumption, increase in its inequality, its impact and the attribution to market distortions are doubtful in the presence of confounding factors. Such factors include droughts, changing HIV/AIDS trends, demographic trends and sample comparability. Section 4.4.3 has highlighted that the 1999 and 2005/06 samples are comparable. Demographic characteristics of the two samples are comparable except for the higher survival of babies born smaller than average. This and the potential effect of increased disease burden due to AIDS have been controlled for in the regressions. In addition, HIV/AIDS prevalence has been declining. This should induce a reduction rather than the observed increase in health inequality due to higher food consumption inequality. Droughts should not be an issue since the food production trends prior to 2005 mirrored the pre 1999 trends with two severe droughts on either side of 1999. Therefore, if any, the influence of other factors on changes the mean of food consumption, its inequality and measured impact should only be minimal. This implies that market distortions are the underlying cause of reduced food consumption, increased inequality in food consumption and consequently worsening health outcomes.

The above evidence implies that not only did distortions lead to economic contraction in Zimbabwe, but led to worsening of health outcomes. Increased market intervention in Zimbabwe actually reversed the gains from earlier investments in human capital. Indeed, the results of this analysis have shown that a reduction in food consumption and an increase in its inequality offset the improvement in health outcomes that resulted from previous investments in education. The average household head among the poor in 2005/06 is more educated. However this has not translated to reductions in the deprivation of basic capabilities such a health because the negative effects of market distortions wiped the gains away. This shows that market distortions have far reaching distributional consequences that directly affect intrinsically important aspects of human life.

4.7 Conclusion

The economic policy regime in Zimbabwe has increasingly become interventionist. This is in contrast to efforts towards minimal intervention under the structural adjustment programmes implemented in the 1990s. The effects of this policy shift were analyzed using DHS data. Results show that food consumption among children in all wealth subgroups

declined along with their mean HAZ and WAZ. The average number of items consumed declined by 34%, mean HAZ by 19% and mean WAZ by 16%. The biggest declines were on outcomes for children living in poor and middle class households. Children in richer households were the least affected. The decline in food consumption contributed to 37% and 57% decline in means of HAZ and WAZ respectively.

Wealth inequality in 2005/06 was 16% relatively higher than inequality in 1999. This contributed to an increase in food consumption inequality. The increase in food consumption inequality is evidenced by a change in the Kakwani concentration index for food consumption by 48% of the 1999 value. Evidence from the decomposition of changes in health inequality shows a considerable impact of the increase in food consumption inequality on child health inequality. The increase in inequality in food consumption contributed to increased nutrition inequality by a magnitude of 11% and 6% of stunting and underweight concentration indices in 1999.

The changes in the level and inequality in food consumption are an outcome of widespread distortions introduced post 1999. Policy changes post 1999 resulted in widespread market distortions. Distortions created exclusive rents, led to asymmetry in access to food and hastened an economic contraction that disproportionately affected the poor. These factors changed the distribution of command of resources and concentrated them in the hands of the wealthy few. This led to increased wealth and consumption inequality as well as a reduction in food consumption. These negatively affected health outcomes. Therefore, market distortions consequently had a large adverse effect on the level and distribution of health outcomes for children in Zimbabwe. This conclusion is reached after taking into account other possible factors that may affect food inequality itself or the measurement of its impact.

4.A Measurement issues

4.A.1 Measuring wealth from asset ownership variables

Since DHS data has no income or expenditure information, wealth is proxied by an asset index derived from PCA. Following the pioneering work of Filmer & Pritchett (2001), the first principal component extracted from asset ownership variables is used to proxy for household wealth. The first principal component is the linear combination that explains the greatest variation in the asset indicators. Thus greater weight is given to assets with higher variability. For n assets denoted by x_j, each with a mean $\overline{x}_j$ and standard deviation s_j, the first principal component for household i is given by (4.8) where a_{1j} are weights (called factor scores). For dummy variable asset indicators, a_{1j}/s_j gives the effect of having the particular asset (x_j) on the asset index.

$$y_{1i} = a_{11}(\frac{x_{1i} - \overline{x}_1}{s_1}) + ... + a_{1n}(\frac{x_{ni} - \overline{x}_n}{s_n}) \tag{4.8}$$

The PCA based asset indices have been shown to be good predictors of household wealth. Filmer & Pritchett (2001) show that the PCA based asset index produces internally coherent results that are consistent with those based on expenditure data for Pakistan, Indonesia and Nepal. McKenzie (2005) further shows that the asset index is reflective of income and expenditure inequality in Mexico. Sahn & Stifel (2003) show that, like income, the asset index is a good predictor of nutrition among children in several developing countries.

Two major issues have to be taken into consideration when constructing the asset index using principal component analysis. These are clumping and truncation. Clumping means that households are grouped in a small number of distinct clusters. Truncation implies that households are spread over a narrow range of the asset index making it difficult to distinguish some groups. These problems can be mitigated through careful selection of asset indicators. This requires including: a) a wide range of asset ownership variables, b) some continuous asset indicators and c) assets with wide variability in their ownership (McKenzie 2005, Vyas & Kumaranayake 2006).

Asset indicators used in this study include durables like television, radio, refrigerator, motorcycle/scooter, oxcart and car. These are combined with housing characteristics like the type of the main floor material, the type of fuel used for cooking, ownership of bed nests, whether the household shares toilet with other households and number of households the toilet is shared with. From these, two indices are computed. The first asset index is

computed with pooled data over the two surveys. This is necessary for computing the McKenzie's (2005) measure of inequality. The pooled index imposes equal weighting of assets in the two periods. However, technology and economic development introduce new assets and change the importance of some of the existing assets. Therefore, a year specific asset indices is also computed but using common assets over the two samples. Unless stated, this is the principal index used in the computations of the Kakwani concentration indices of various variables and all the analysis in this chapter.

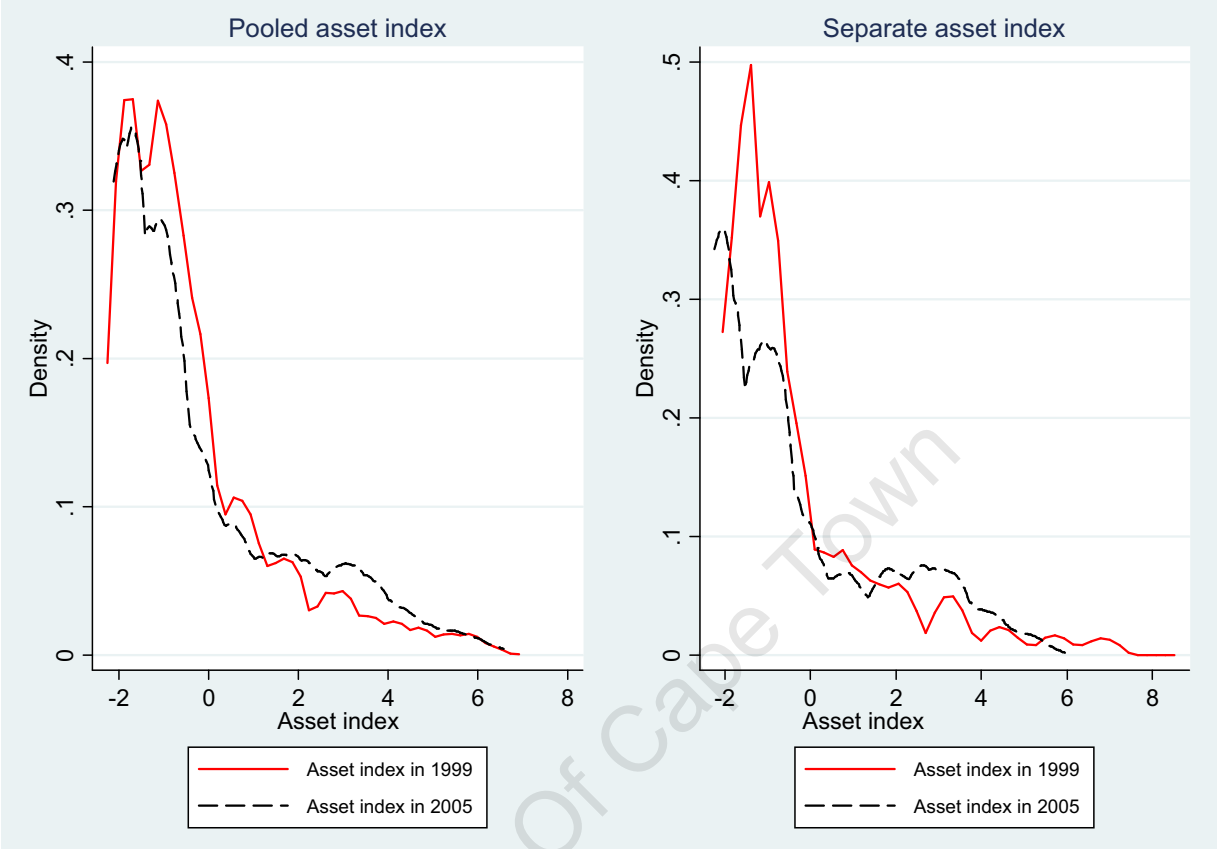
Table 4.5 presents the ownership of durable assets by the computed year specific asset index quartiles. The presented figures show internal coherence of the asset index. It is encouraging to note that none of the households in the poorest quartiles owned a car, telephone or refrigerator in both years. Ownership of all durable assets except bicycle increases with the asset quartile. The high proportion of bicycle ownership in the middle quartile are not inconsistent either. More households in the middle are likely to own a bicycle as a substitute for cars they can not afford while only a small percentage of the poorest households can afford them. Among the poorest, none of them have cement, tiled nor carpeted floors as expected. These housing characteristics show a higher proportion of carpeted and tiled floors in the richest quartiles than lower quartiles. This further points to the internal validity of the asset index.

The distribution in the asset index is shown in figure 4.4. The pooled asset index refers to the asset index constructed for the data pooled over the two samples. The separate asset

Table 4.5. Housing characteristics and ownership of durable assets by asset index quartiles (in percentages)

	1999				**2005/06**			
Variable Description	Poorest	Second	Middle	Richest	Poorest	Second	Middle	Richest
Car or truck	0.00	0.00	1.01	23.56	0.00	0.29	3.84	21.59
Telephone	0.00	0.00	0.32	22.04	0.00	0.00	1.13	32.15
Refrigerator	0.00	0.00	0.76	48.32	0.00	0.00	3.84	69.10
Bicycle	9.09	23.18	31.12	22.86	13.53	21.86	35.01	33.49
Motorcycle	0.00	0.00	0.44	2.28	0.00	0.34	1.4	2.90
Radio	11.93	24.22	71.55	90.75	0.00	24.35	77.02	92.99
Share toilet	49.75	46.26	61.43	53.33	31.98	39.28	44.26	31.51
Earth floor	100.00	25.54	2.73	0.13	100.00	26.10	4.66	1.33
Cement floor	0.00	74.46	96.63	78.39	0.00	73.90	94.30	86.09
Ceramic tiles	0.00	0.00	0.06	3.74	0.00	0.00	0.72	7.11
Carpeted floor	0.00	0.00	0.51	14.32	0.00	0.00	0.72	7.11

Figure 4.4. The distribution of the asset indices over the two samples



index refers to the asset index constructed separately for each year but using common indicators over the two samples. Both indicators show a reduction in wealth in the lower part of the distribution and an increase in the upper middle of the distribution. The distribution of wealth is truncated around -2. This point corresponds to households who do not own any assets and live in houses floored with cow dung, sand or clay. These are the poorest people living in rural areas. Even the distribution of income is likely to have a spike corresponding to the mode of income for this group.

4.A.2 Food consumption index

Food consumption is proxied by a food consumption index constructed by summing up food items consumed by the child. These food items are captured from responses to 11 of the questions on food items asked in the DHS data. Among these are consumption of legumes, vegetables, meat, vitamin A fruits, other fruits, grains, cereals and milk products.

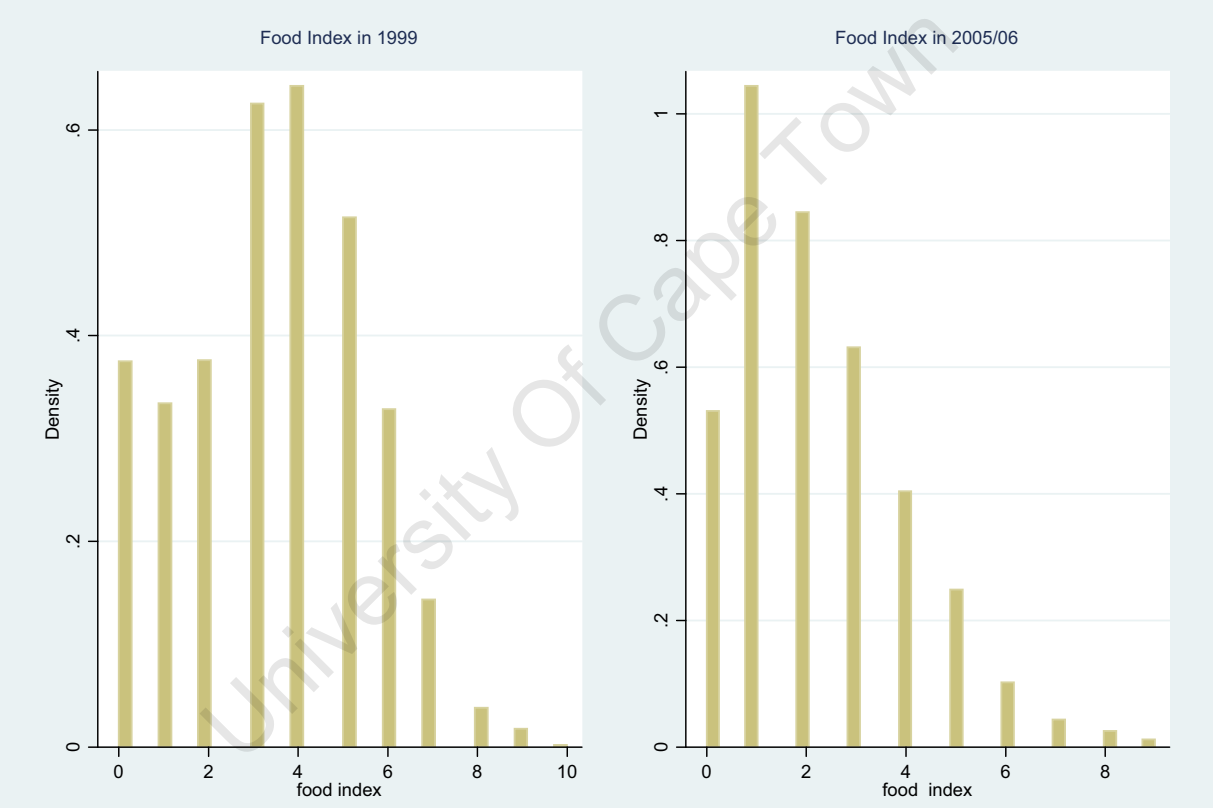
Thus in practise, the index is actually a food variety score. These types of measures are widely used in the literature to capture dietary diversity and were found to be positively correlated with greater intake of nutrients in developing countries (see Hatloy et al. 1998, Hatloy et al. 2000, Onyango et al. 1998).

The literature on nutrition distinguishes between a dietary diversity score (DDS) and a food variety score (FVS). Both scores are based on regrouping food items into 7 or 8 subgroups (see Arimond & Ruel 2004, Moursi et al. 2008, Steyn et al. 2006). The core 7 subgroups included are 1) starchy staples, 2) legumes, 3) dairy, 4) vitam A fruits and vegetables 5) other fruits and vegetables, 6) fruits made from oil and butter and 7) meat, poultry fish or eggs. The 8^{th} subgroup is fats and oils. The DDS gives a score of 1 for a subgroup if at least 1 of the food items in that subgroup has been consumed and 0 otherwise. The scores for all the subgroups are then summed up to give the DDS. On the other hand, the FVS simply sums up all the food items consumed across the various subgroups. I take the later approach and compute the food index based on the above subgroups excluding fats and oils which are not captured in the Zimbabwe DHS.

Both the DDS and FVS are good predictors of nutritional intake. However, following the results from Steyn et al. (2006), the FVS is preferred. In an analysis based on the National Food Consumption Survey, 1999 for South Africa, Steyn et al. (2006) found a positive correlation between mean nutrient adequacy ratio and both the food variety score (FVS) and DDS for 1 - 8 year old children. However, the Pearson correlation coefficients of mean nutrient adequacy ratio and FVS or DDS were higher for FVS for all subgroups (i.e. 1-3 years, 4-6 years and 7-8 years). Similary, Pearson correlations between height and weight for age z-scores and DDS or FVS were higher for FVS. This motivates the choice of the FVS.

The food indices for the two samples is presented in figure 4.5. It shows a big reduction in the food variety index in 2005/06 when compared to 1999. The mode of food index for 1999 is 4 food items compared to 1 food item in 2005/06. The figure highlights that despite the general shift to consumption of few food items in 2005/06, there are children who still managed to consume a wider range of food items. This is consistent with the effects of market distortions highlighted earlier.

Figure 4.5. The distribution of the food indices over the two samples



Chapter 5

Conclusion

5.1 Summary of findings

The thesis showed that market distortions generate rents which attract bribery that accrue to office bearers. The outcome generated by this bribery is inefficient, even if such bribery is competitive. This is in contrast to the "efficiency outcome" of competitive bribery obtained in past literature. Market distortions lead to sub-optimal outcomes yet they continue to play a prominent role in economic policy in developing countries. Their continued existence is largely attributable to office bearers' motive to maximize the appropriation of rents generated by market distortions. It is the interaction between these bureaucratic incentives and the quality of institutions that determines the level of market distortions in the economy. Theories that fail to take the quality of institutions and bureaucratic financial incentives for market distortions will not adequately explain the existence of high distortions.

Self enriching policy makers aim to maximize on the appropriation of rents from market distortions. This entails raising the level of distortions despite welfare losses they impose. Consideration for welfare losses only arises when they affect the likelihood of future extraction of rents. When institutions are strong, society can hold the policy maker accountable by voting them out if welfare losses are excessive. A policy maker who cares about continued extraction of rents will not choose distortions that lead to such excessive welfare losses. This electoral accountability is absent when institutions are weak because the office bearer can use electoral manipulation to pacify political pressure. This permits the office bearer to maximize on rents by raising distortions and then manipulate the election to

keep hold over power. Thus distortions are higher and last longer in countries with weak democratic institutions. This argument is confirmed on exchange rate overvaluation in Sub-Sahara Africa. Dictatorships overvalued the exchange rate by a greater magnitude than democracies.

Events in Zimbabwe post 1999 substantiate this argument. High distortions have prevailed since 2000. These distortions placed command over resources in the hands of a few people in positions of influence. This negatively affected social outcomes. Health outcomes among children worsened due to limited access to food by the majority of the population after the policy shift. The decline in food consumption was greater among the poorest and the middle class who did not benefit from the rents. Inequality in food consumption increased along with the increase in wealth inequality. This had a negative effect on health inequality. Yet the incumbent government survived several elections and distortions continued to increase despite their negative impact on the well being of the majority. The use of violence and intimidation in these elections is widely documented. At the same, supporting democratic institutions were too weak to enforce free and fair elections. The weakness of these institutions and the subsequent erosion of electoral accountability made it possible for the incumbent to extract higher rents over a long period. This caused great harm to society as evidenced by the worsening of health outcomes after the policy shift.

5.2 Implications of the findings

Distortions that arise due to office bearers' pursuit of rents have negative effects on well being. They cause further deprivation of human capabilities and functions such as health as highlighted in the case of Zimbabwe. Thus distortions increase poverty. The current focus on the macro effects of market distortions understates their consequences. Efficiency, trade, productivity, corruption and growth are only instrumentally important for improving well-being. Individual health, nutrition and other social outcomes that reflect human capabilities and functions are intrinsically important. They are the ultimate objective of economic policies. These deserve more attention in order to fully capture the consequences of market distortions.

Distortions owe their continued existence to weak democratic institutions hence lack of accountability. Accordingly, their negative social effects are attributable to the weakness of democratic institutions and lack of electoral accountability too. Thus just as people speak of institutions as deep determinants of growth, they should speak of them as deep deter-

minants of poverty as well. Support for the claim comes from the finding that democratic institutions play an integral role in determining the level of market distortions hence the magnitude of social costs of market distortions. Therefore, governance should be given as much weight as sound economic management when mapping poverty reduction strategies.

Market distortions are a major cause of corruption in developing countries. This corruption leads to losses in efficiency but they benefit office bearers. These office bearers have an incentive to maintain high distortions and extract higher rents subject to political constraints they face. These constraints are determined by the quality of democratic institutions. Thus the underlying cause of high market distortions and corruption in developing countries has roots in the weak institutional framework that fail to address bureaucratic incentives and control their moral hazard.

5.3 Areas of future study

The policy shift in Zimbabwe negatively affected health outcomes hence increased poverty. The thesis found that access to food declined after the policy shift. This calls for a further investigation on the impact of reduced access to food on absolute poverty as measured food-energy intake for various sub-groups. Changes in school attendance and grades progression is another aspect of poverty that needs to be investigated in the context of policy changes in Zimbabwe. This will contribute to the evaluation of the full social impact of market distortions sustained to benefit the incumbent in a weak policy environment.

The case of rent generating distortions highlights a conflict of interest for self enriching policy makers. The same conflict of interest arises with bureaucrats in business. These bureaucrats may have vested interest that are directly affected by economic or sectoral policies they draft. They have an incentive to implement policies that maximize profits from their businesses irrespective of welfare consequences of such policies. There is need to investigate the impact of bureaucrats in business on the quality of economic policies and research on the design of an institutional framework that aligns the incentives of bureaucrats to maximization of social welfare.

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Appendix A

Tables

Table A.1. Static panel results

VARIABLES	pooled_OLS	pooled_IV	Fixed Effects (FE)
Polity2	-0.0297***	-0.0271***	-0.0209***
	(0.00846)	(0.00879)	(0.00571)
ODA aid	-2.390***	-2.641***	-1.436***
	(0.485)	(0.528)	(0.299)
Terms of trade	0.00452***	0.00410***	0.00491***
	(0.00144)	(0.00149)	(0.000862)
Openness	0.000174	0.00322	6.27e-07
	(0.00218)	(0.00321)	(0.00246)
Transition88	1.582***	1.637***	0.198
	(0.275)	(0.282)	(0.155)
Transition77	1.457***	1.495***	0.0355
	(0.261)	(0.266)	(0.145)
GDP per capita	-0.230**	-0.301**	-0.581***
	(0.106)	(0.120)	(0.166)
FDI	0.00916	-0.0321	0.00843
	(0.0134)	(0.0344)	(0.00717)
Constant	1.837**	2.312***	4.267***
	(0.769)	(0.860)	(1.176)
Observations	376	376	376
FE test (F-statistic)			52.60***

*** p<0.01, ** p<0.05, * p<0.1, Standard errors in parentheses

Table A.2. Mean food index, HAZ and WAZ by asset quartile

	Food Index			**HAZ**			**WAZ**		
Asset Range	1999	2005	%Δ	1999	2005	%Δ	1999	2005	%Δ
poorest 25%	2.76	1.68	-39.11	-1.32	-1.48	-12.12	-0.80	-0.94	-17.5
25 - 50 %	3.03	2.00	-33.99	-1.45	-1.40	3.44	-0.80	-0.82	-2.5
50 - 75 %	3.56	2.22	-37.64	-1.12	-1.16	-3.57	-0.56	-0.58	-3.57
75 - 100%	4.23	3.29	-22.22	-0.98	-1.17	-19.38	-0.32	-0.37	-15.62
All	3.41	2.24	-34.31	-1.17	-1.36	-16.52	-0.61	-0.69	-13.11

NB –Based on an asset index computed separately for 1999 and 2005

Table A.3. Concentration indices based on the pooled asset index

	1999			2005			
Variable	Mean	C index	Std Error[a]	Mean	C index	Std Error[a]	Δ C
Stunting[b]	1.168	-0.0775	0.0159	1.361	-0.0490	0.0104	-36.8
Underweight[b]	0.608	-0.182	0.0213	0.693	-0.194	0.0160	6.6
Food consumption	3.406	0.0971	0.00609	2.244	0.140	0.00725	44.1
Access to sanitation	0.633	0.228	0.00691	0.601	0.271	0.00587	18.9
Has Diarrhea	0.141	-0.0444	0.0251	0.131	-0.0947	0.0212	113.2
No. of under 5 in household	1.747	-0.0478	0.00485	1.812	-0.0499	0.00345	4.4
Access to safe water	0.765	0.101	0.00498	0.701	0.140	0.00468	39.0
Lives in rural area	0.766	-0.209	0.00632	0.750	-0.230	0.00533	10.1
Age	29.613	-0.00047	0.00540	30.015	-0.00216	0.00433	360.6
Age squared	1175.2	-0.00141	0.00835	1205.7	-0.00513	0.00665	264.0
Gender (female=1)	0.496	0.00635	0.00933	0.499	0.00869	0.00746	36.8
Mother's education	4.431	-0.0396	0.00457	4.282	-0.0428	0.00339	8.2
Household head education	6.458	0.162	0.00546	6.852	0.127	0.00376	-21.3
Household head sex	0.367	-0.0832	0.01183	0.348	-0.0946	0.00994	13.7
Was born small	0.160	-0.0570	0.0242	0.150	-0.0638	0.0202	11.9
Had fever	0.256	-0.0207	0.0176	0.0844	-0.0342	0.0272	65.4
Had a cough	0.399	-0.0243	0.0128	0.224	-0.0831	0.0152	241.2
Household head age	42.206	-0.0360	0.00309	42.341	-0.0172	0.00261	-52.1

a - This is the standard error of the concentration index

b - These are based on the negative of HAZ and WAZ

Table A.4. Descriptive statistics: Composition of DHS samples for 1999 and 2005/6

		All		Mother Present		Mother Absent	
Variable	**Category**	**1999**	**2005**	**1999**	**2005**	**1999**	**2005**
Sample size		3892	5943	3327	5034	565	909
Type of residence	urban	23.43	25.03	24.47	26.36	17.35	17.6
	rural	76.57	74.97	82.85	82.4	75.53	73.64
Gender	male	50.41	50.12	50.62	50.02	49.2	50.72
	female	49.59	49.88	49.38	49.98	50.8	49.28
Household head gender	male	63.28	65.21	65.46	67.48	50.44	52.59
	female	36.72	34.79	34.54	32.52	49.56	47.41
Orphan		0.5	10.07	–	–	4.19	8.44
Father is alive		93.45	92.05	95.44	94.6	81.52	77.9
Mother is alive		98.48	97.59	–	–	89.29	84.16
Mother not in household		14.52	15.3	–	–	–	–
Household head age	below 18	0.73	0.3	0.7	.023	0.94	0.7
	19-29	24.06	23.08	26.63	26.03	8.82	6.62
	30-39	26.86	30.37	29.99	34.03	9.01	9.87
	40-49	18.29	14.94	18.11	15.1	19.32	14.05
	50-59	13.38	14.83	11.87	12.03	22.33	30.55
	60+	16.58	165.48	12.7	12.59	39.59	38.21
Relation to household head	son/daughter	64.72	63.28	74.27	73.48	8.5	6.44
	grandchild	26.77	28.06	18.97	19.61	72.74	75.11
	other	8.48	8.65	6.73	6.9	18.77	18.44
Relation structure	1 adult	11.87	11.68	11.72	11.01	12.74	15.4
	2 adults, opp sex	34.89	34.69	37	37.31	22.48	20.24
	2 adults same sex	4.75	5.47	4.54	4.99	6.02	8.14
	3+ related adults	42.39	43.72	40.73	42.35	52.21	51.27
	unrelated adults	6.09	4.42	6.01	4.33	6.55	4.95

Note: Except for samples size, statistics for all variables and their categories are proportions (%)

Table A.5. Demographic statistics: Comparison of DHS samples for 1999 and 2005/6

Variable	Category			2005	1999
	Major category	Sub-Category			
Household population by sex and age	Male	Urban (%)	0 - 4	12	12.9
			5 - 9	12.7	10.6
		Rural (%)	0 - 4	16.4	14.6
			5 - 9	18.3	16.3
	Female	Urban (%)	0 - 4	11.8	13
			5 - 9	11.2	10.4
		Rural (%)	0 - 4	14.1	13.3
			5 - 9	15.2	15.1
	Total	Urban (%)	0 - 4	11.9	12.9
			5 - 9	11.9	10.5
		Rural (%)	0 - 4	15.2	14
			5 - 9	16.6	15.7
Fertility rates	Total fertility rate 15 - 49			3.8	4
	General fertility rate (per 1000)			137	141
	Crude birth rate per 100		Urban	28.5	31.3
			Rural	32	30.8
			All	31	31
Children ever born and living (household means)	All	Children ever born		2.15	2.31
		Children living		1.99	2.1
	Currently married	Children ever born		2.89	3.13
		Children living		2.69	2.85
Infant mortality (per 1000 births)	5 year period of analysis		0-4	59.9	65
			5-9	37.1	53.8
	Size at birth		$\leq$ average	83	118.8
			$\geq$ average	55.4	51.9
	Rural			50.6	65.3
	Urban			46.5	47.2
	Total			49.4	59.7

Table A.6. Results: Determinants of HAZ and WAZ

	1999		2005		1999		2005	
VARIABLES	HAZ	selection	HAZ	selection	WAZ	selection	WAZ	selection
rural	0.0930	0.184**	-0.224**	0.0593	-0.101	0.174**	-0.156**	0.0866
	(0.110)	(0.0814)	(0.0978)	(0.0764)	(0.0693)	(0.0850)	(0.0711)	(0.0779)
sanitation	0.123	0.0124	-0.0106	-0.118*	0.0664	0.0519	0.149***	-0.108*
	(0.0928)	(0.0649)	(0.0776)	(0.0608)	(0.0593)	(0.0679)	(0.0569)	(0.0621)
safe water	0.0981	0.0315	-0.131*	-0.0738	0.0656	0.0258	-0.0036	-0.0307
	(0.0996)	(0.0699)	(0.0782)	(0.0622)	(0.0639)	(0.0732)	(0.0574)	(0.0634)
No. of children	-0.0889	-0.0621	-0.0811	0.387***	-0.181**	-0.0410	-0.234***	0.451***
	(0.137)	(0.0931)	(0.122)	(0.0912)	(0.0900)	(0.0987)	(0.0895)	(0.0931)
No. of children-2	-0.0058	0.0001	-0.00115	-0.0721***	0.0339*	-0.0084	0.0299*	-0.0858***
	(0.0281)	(0.0186)	(0.0243)	(0.0179)	(0.0188)	(0.0201)	(0.0179)	(0.0182)
Household size	0.0094	0.0194	0.0033	0.0225*	-0.0134	0.0326**	0.0107	0.0288**
	(0.0197)	(0.0134)	(0.0175)	(0.0129)	(0.0127)	(0.0142)	(0.0127)	(0.0129)
Household head sex	-0.256***	-0.341***	-0.127*	-0.340***	-0.0950*	-0.372***	0.000312	-0.368***
	(0.0866)	(0.0601)	(0.0730)	(0.0560)	(0.0560)	(0.0627)	(0.0538)	(0.0569)
Household head age	-0.0194	-0.0693***	-0.0270**	-0.0975***	0.0165	-0.0763***	-0.0056	-0.0979***
	(0.0162)	(0.0113)	(0.0131)	(0.0097)	(0.0104)	(0.0118)	(0.00974)	(0.00992)
Household head age-2	8.5e-5	0.0004***	0.0001	0.0006***	-0.0002**	0.0004***	-1.0e-5	0.0006***
	(0.0002)	(0.0001)	(0.0001)	(9.2e-5)	(0.0001)	(0.0001)	(9.6e-5)	(9.5e-5)
Household head education	0.0291**		0.0039		0.0291***		0.0295***	

Table A.6. Results: Determinants of HAZ and WAZ

	1999		2005		1999		2005	
VARIABLES	HAZ	selection	HAZ	selection	WAZ	selection	WAZ	selection
	(0.0125)		(0.0120)		(0.0083)		(0.0090)	
Mothers's education	0.0265		0.0111		0.0090		0.0076	
	(0.0177)		(0.0164)		(0.0121)		(0.0123)	
Age in months	-0.132***	-0.0943***	-0.148***	-0.104***	-0.0545***	-0.0931***	-0.0761***	-0.103***
	(0.0123)	(0.0096)	(0.0102)	(0.0084)	(0.0080)	(0.0098)	(0.0076)	(0.0085)
Age squared	0.0026***	0.0010***	0.0018***	0.0010***	0.0006***	0.0010***	0.0009***	0.0010***
	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Gender	0.258***		0.206***		0.201***		0.142***	
	(0.0709)		(0.0623)		(0.0479)		(0.0469)	
Was born small	-0.428***		-0.350***		-0.464***		-0.514***	
	(0.0988)		(0.0864)		(0.0667)		(0.0652)	
Breastfeeding duration	0.0024		0.0145**		-0.0094*		0.0018	
	(0.0074)		(0.0059)		(0.0048)		(0.0044)	
Food*Breastfeeding	0.0009		-0.103***		-0.0084		-0.0368*	
	(0.0263)		(0.0274)		(0.0172)		(0.0202)	
Food consumption index	0.0611***		0.0605***		0.0457***		0.0613***	
	(0.0226)		(0.0228)		(0.0154)		(0.0173)	
Has diarrhea	-0.277**		-0.219**		-0.119		-0.252***	
	(0.109)		(0.0927)		(0.0727)		(0.0696)	

Table A.6. Results: Determinants of HAZ and WAZ

	1999		2005		1999		2005	
VARIABLES	HAZ	selection	HAZ	selection	WAZ	selection	WAZ	selection
Has fever	0.0536		-0.0043		-0.228***		-0.236**	
	(0.0914)		(0.122)		(0.0616)		(0.0926)	
Coughs	-0.0288		-0.0556		-0.0362		0.0174	
	(0.0795)		(0.0783)		(0.0536)		(0.0592)	
Father alive		0.409***		0.479***		0.508***		0.487***
		(0.0854)		(0.0800)		(0.0956)		(0.0861)
Mother alive		0.645***		1.014***		0.640***		1.022***
		(0.113)		(0.103)		(0.113)		(0.103)
Constant	0.425	3.813***	1.308***	4.013***	-0.0228	3.916***	0.467*	3.948***
	(0.449)	(0.357)	(0.374)	(0.327)	(0.292)	(0.376)	(0.277)	(0.332)
lambda	1.667	(0.062)	1.340	(0.076)	0.775	(0.085)	0.783	(0.079)
rho	0.837	(0.021)	0.743	(0.034)	0.613	(0.059)	0.587	(0.053)
Observations	2945	2945	3723	3723	3043	3043	3876	3876
$\rho = 0\ \chi^2(1)$	97.21	[0.0000]	31.17	[0.0000]	18.23	[0.0000]	3.52	[0.0606]..

*** p<0.01, ** p<0.05, * p<0.1

Standard errors in parentheses

Table A.7. Results with robust clustered standard errors: Determinants of HAZ and WAZ

	HAZ		WAZ	
VARIABLES	1999	2005	1999	2005
Rural	0.0930	-0.2241**	-0.1014	-0.1561**
	(0.1150)	(0.1038)	(0.0718)	(0.0780)
Sanitation	0.1226	-0.0106	0.0664	0.1491**
	(0.1022)	(0.0820)	(0.0641)	(0.0614)
Safe water	0.0981	-0.1313	0.0656	-0.0036
	(0.1112)	(0.0824)	(0.0695)	(0.0617)
No. of children	-0.0889	-0.0811	-0.1808*	-0.2339***
	(0.1572)	(0.1293)	(0.0991)	(0.0893)
No. of children squared	-0.0058	-0.0011	0.0339	0.0299
	(0.0337)	(0.0259)	(0.0209)	(0.0182)
Household size	0.0094	0.0033	-0.0134	0.0107
	(0.0197)	(0.0179)	(0.0135)	(0.0137)
Household head gender	-0.2556***	-0.1273	-0.0950	0.0003
	(0.0944)	(0.0780)	(0.0598)	(0.0587)
Household head age	-0.0194	-0.0270*	0.0165	-0.0056
	(0.0174)	(0.0146)	(0.0107)	(0.0104)
Household head age2	0.0001	0.0001	-0.0002**	-0.0000
	(0.0002)	(0.0001)	(0.0001)	(0.0001)
Household head education	0.0291**	0.0039	0.0291***	0.0295***
	(0.0131)	(0.0121)	(0.0092)	(0.0094)
Mothers' education	0.0265	0.0111	0.0090	0.0076
	(0.0194)	(0.0173)	(0.0127)	(0.0137)
Age in months	-0.1322***	-0.1477***	-0.0545***	-0.0761***
	(0.0144)	(0.0118)	(0.0088)	(0.0075)
Age squared	0.0016***	0.0018***	0.0006***	0.0009***
	(0.0002)	(0.0002)	(0.0001)	(0.0001)
Gender	0.2578***	0.2065***	0.2006***	0.1423***
	(0.0700)	(0.0628)	(0.0480)	(0.0475)

Was born small	-0.4282***	-0.3505***	-0.4638***	-0.5135***
	(0.0945)	(0.0867)	(0.0689)	(0.0670)
Breastfeeding duration	0.0024	0.0145*	-0.0094	0.0018
	(0.0106)	(0.0074)	(0.0059)	(0.0043)
Food*Breastfeeding	0.0009	-0.1025***	-0.0084	-0.0368*
	(0.0297)	(0.0303)	(0.0175)	(0.0205)
Food consumption index	0.0611***	0.0605**	0.0457***	0.0613***
	(0.0235)	(0.0251)	(0.0155)	(0.0173)
Has diarrhea	-0.2774**	-0.2195**	-0.1193	-0.2517***
	(0.1095)	(0.0933)	(0.0745)	(0.0728)
Has fever	0.0536	-0.0043	-0.2285***	-0.2355**
	(0.0950)	(0.1141)	(0.0606)	(0.0940)
Coughs	-0.0288	-0.0556	-0.0362	0.0174
	(0.0805)	(0.0756)	(0.0541)	(0.0588)
Constant	0.6804	1.4355***	0.0722	0.4662
	(0.4968)	(0.4114)	(0.3167)	(0.2994)
lambda	0.6804	1.4355***	0.0722	0.4662
	(0.4968)	(0.4114)	(0.3167)	(0.2994)
rho	0.6804	1.4355***	0.0722	0.4662
	(0.4968)	(0.4114)	(0.3167)	(0.2994)
Observations	2945	3723	3043	3876

NB: Selection equations are not presented in the table, Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A.8. OLS regression results: Determinants of HAZ and WAZ for children living with their mothers only

	1999		2005	
VARIABLES	HAZ	HAZ	WAZ	WAZ
Rural	0.0290	-0.2667***	-0.1344*	-0.1703**
	(0.107)	(0.101)	(0.069)	(0.077)
Sanitation	0.1029	0.0240	0.0544	0.1716***
	(0.097)	(0.079)	(0.062)	(0.060)
Safe water	0.0704	-0.1386*	0.0512	0.0026
	(0.105)	(0.080)	(0.068)	(0.060)
No. of children	-0.0958	-0.2340*	-0.1904**	-0.2988***
	(0.146)	(0.119)	(0.092)	(0.087)
No. of children squared	0.0046	0.0279	0.0395**	0.0412**
	(0.031)	(0.023)	(0.019)	(0.018)
Household size	-0.0157	-0.0065	-0.0211*	0.0078
	(0.018)	(0.017)	(0.012)	(0.013)
Household head gender	-0.0432	0.0337	-0.0014	0.0905
	(0.088)	(0.075)	(0.056)	(0.057)
Household head age	0.0101	0.0013	0.0296***	0.0096
	(0.016)	(0.014)	(0.010)	(0.010)
Household head age squared	-0.0000	0.0000	-0.0003***	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)
Household head education	0.0244*	0.0028	0.0284***	0.0295***
	(0.014)	(0.012)	(0.009)	(0.009)
Mothers' education	0.0252	0.0086	0.0079	0.0071
	(0.020)	(0.018)	(0.013)	(0.014)
Age in months	-0.1087***	-0.1309***	-0.0425***	-0.0655***
	(0.016)	(0.012)	(0.009)	(0.007)
Age squared	0.0014***	0.0018***	0.0005***	0.0009***
	(0.000)	(0.000)	(0.000)	(0.000)
Gender	0.2702***	0.1942***	0.2035***	0.1311***
	(0.073)	(0.064)	(0.048)	(0.048)
Was born small	-0.4632***	-0.3401***	-0.4611***	-0.5018***
	(0.099)	(0.090)	(0.068)	(0.068)
Breastfeeding duration	0.0036	0.0139*	-0.0098	0.0013

	(0.013)	(0.008)	(0.006)	(0.004)
Food*Breastfeeding	-0.0016	-0.1286***	-0.0169	-0.0460**
	(0.031)	(0.031)	(0.018)	(0.021)
Food consumption index	0.0598**	0.0720***	0.0443***	0.0655***
	(0.024)	(0.026)	(0.016)	(0.018)
Has diarrhea	-0.2978***	-0.2151**	-0.1174	-0.2402***
	(0.113)	(0.095)	(0.074)	(0.072)
Has fever	0.0716	-0.0204	-0.2400***	-0.2365**
	(0.099)	(0.119)	(0.061)	(0.095)
Coughs	-0.0536	-0.0840	-0.0396	0.0105
	(0.084)	(0.077)	(0.054)	(0.059)
Constant	-0.3780	0.5582	-0.3923	-0.0796
	(0.480)	(0.405)	(0.306)	(0.290)
Observations	2404	2829	2503	2982
R-squared	0.093	0.108	0.112	0.116

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix B

Figures

Figure B.1. Comparison of height for age distributions by mother presence in household

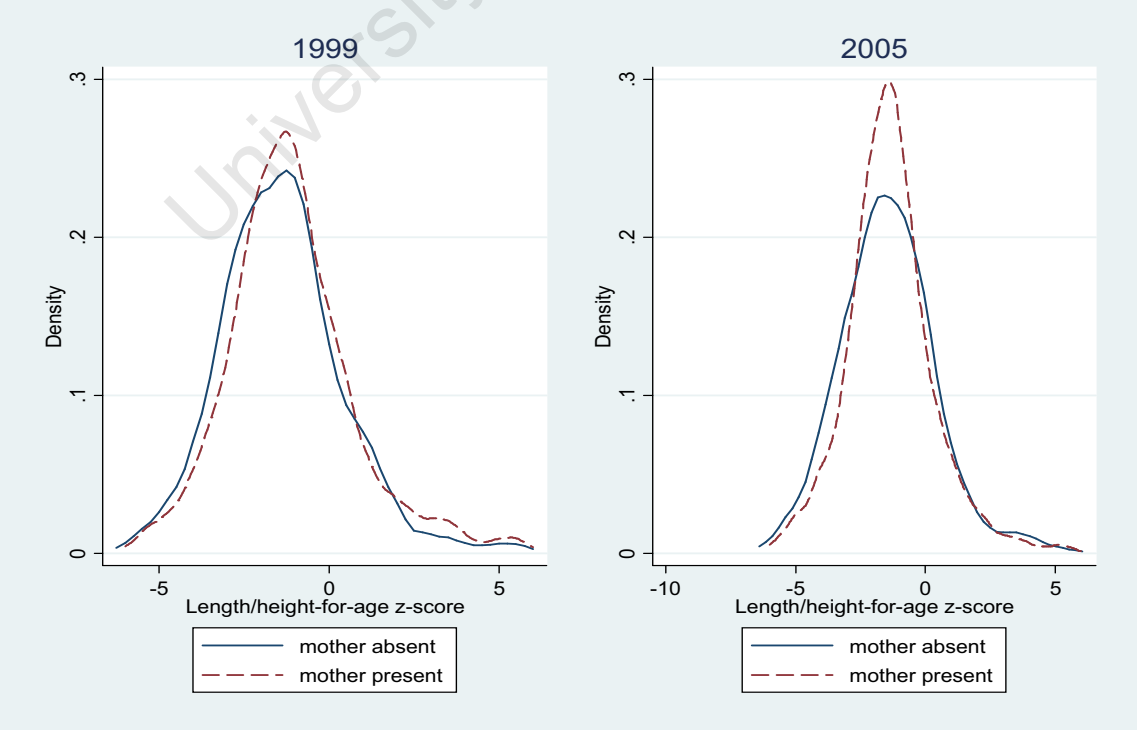


Figure B.2. Comparison of weight for age distributions by mother presence in household

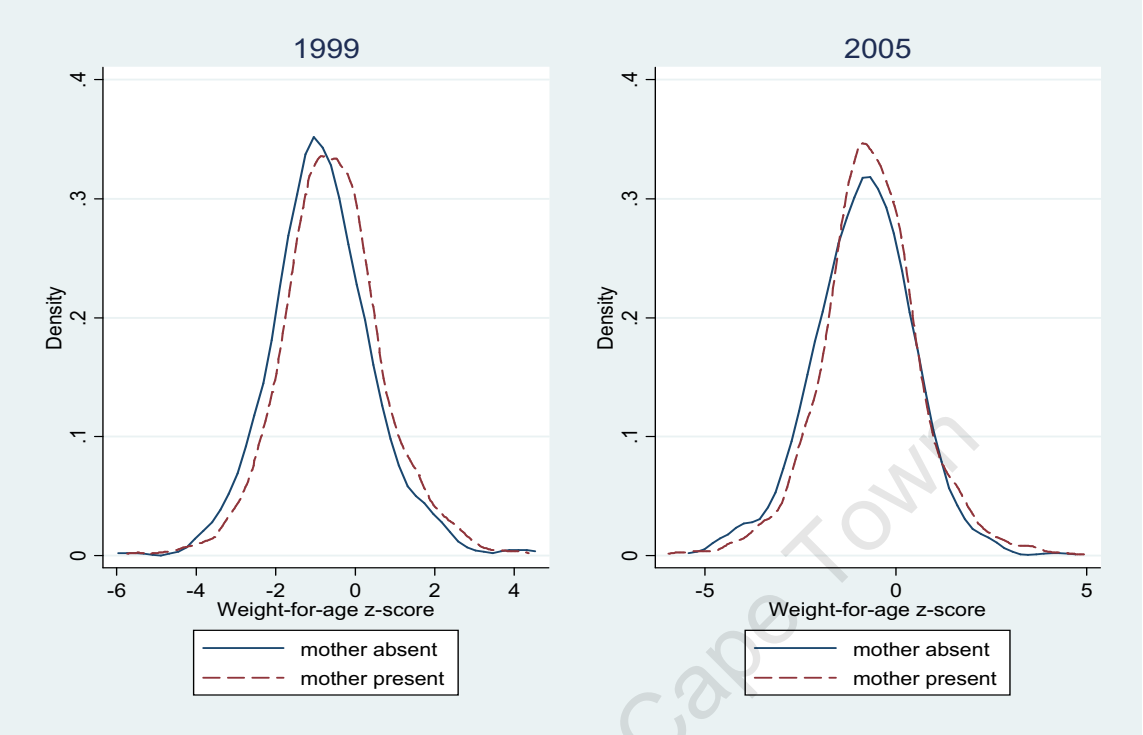


Figure B.3. Comparison of the distribution of mothers' age between 1999 and 2005

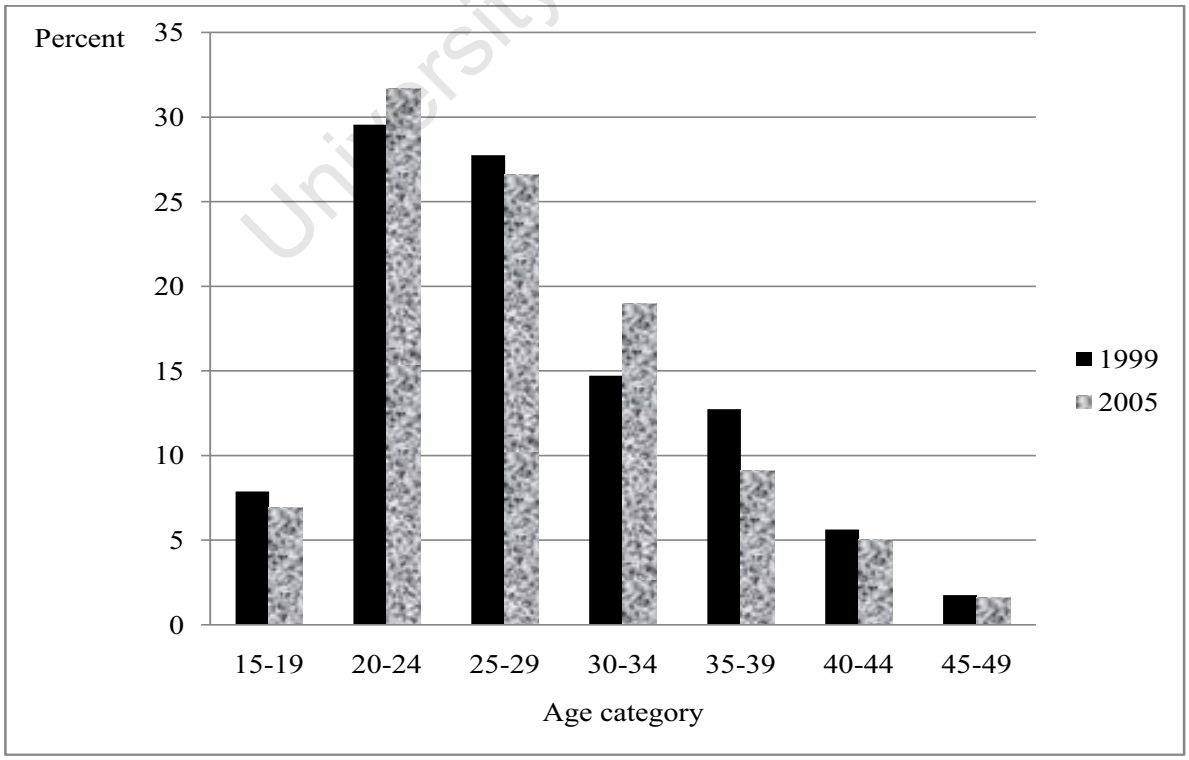


Figure B.4. Distribution of household size in the DHS samples for 1999 and 2005/06

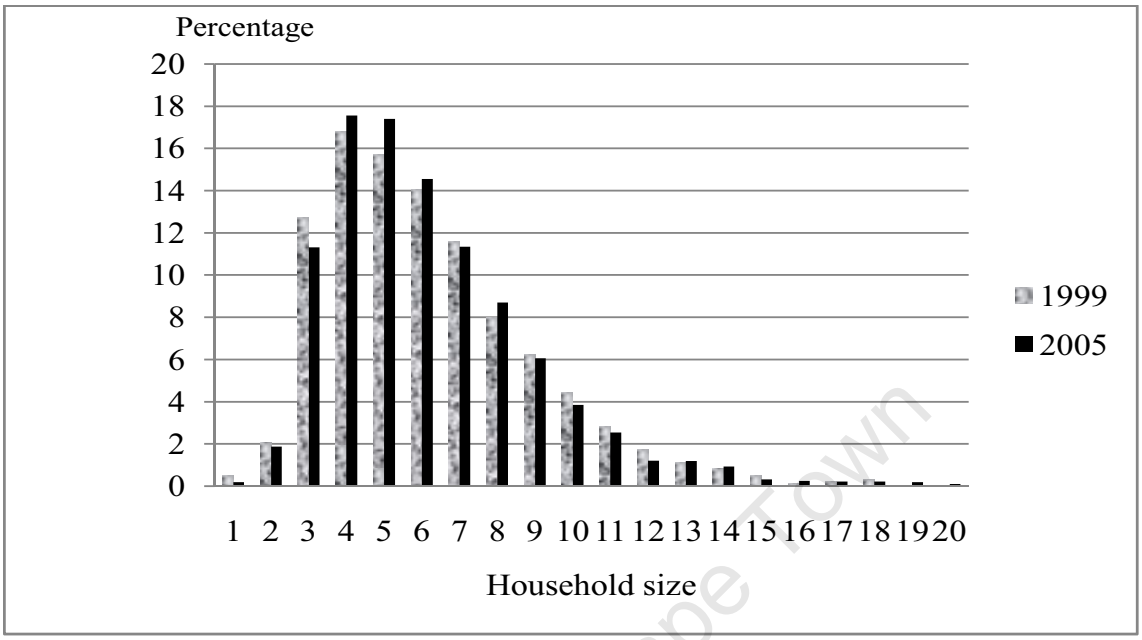
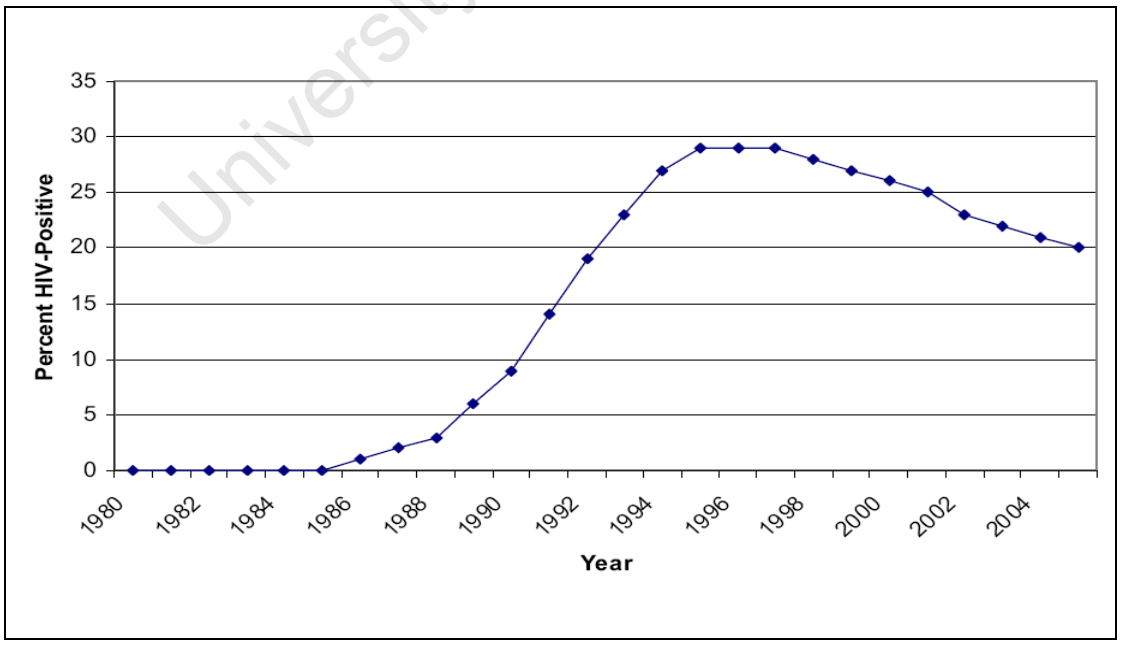
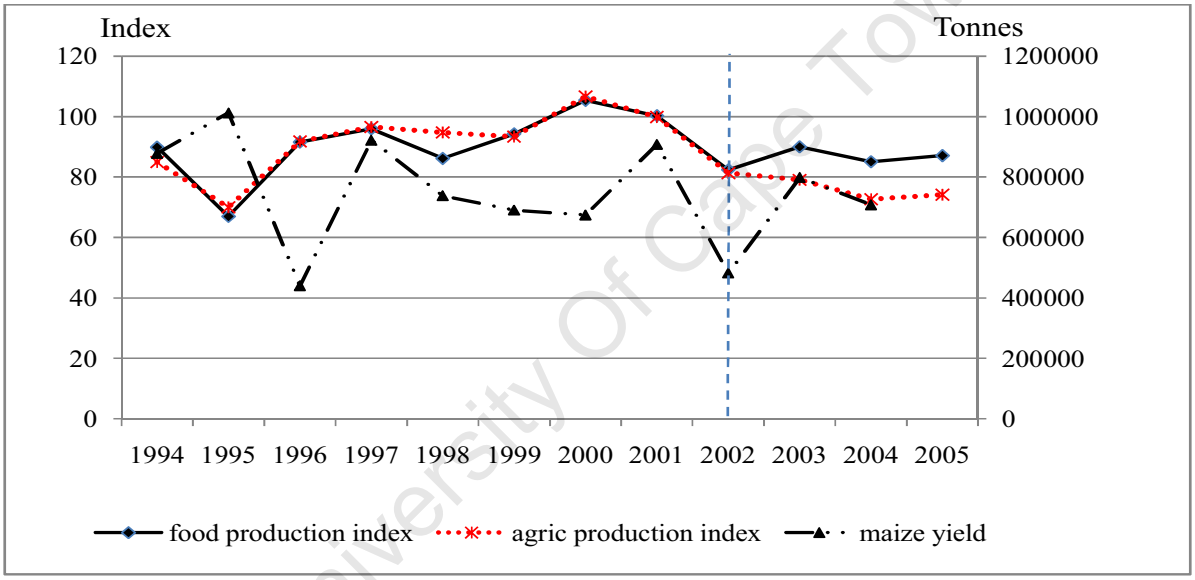


Figure B.5. Trends in estimated adult prevalence in Zimbabwe: 1980 to 2005



Adopted from MOHCW, 2005

Figure B.6. Trends in agriculture production in Zimbabwe: 1994 to 2005



Source: FAO/WFP , Various and AfDB, 2007